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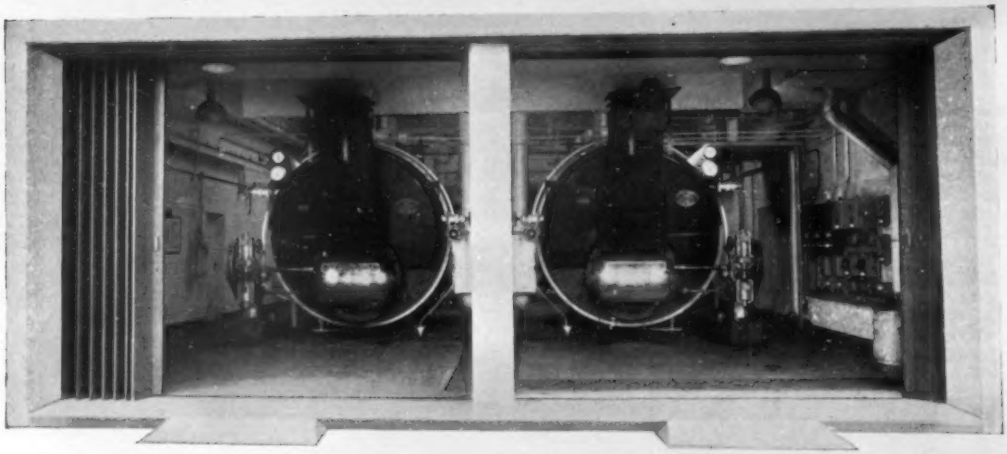
take a look at efficient coal utilisation...*

Take a look at the boiler house at Grimethorpe proudly used by the National Coal Board as a showpiece of efficiency! Two Ruston Horizontal 'Thermax' boilers provide steam and hot water for No. 4 Area Workshops (North Eastern Division.) The N.C.B. with their vast experience, know that the 'Thermax' gives exceptional service. Efficiencies of 80% and over are usual—*whether fired by coal or any other fuel.* Only *the genuine* 'Thermax' is backed by 25 years of production and application know-how. This Ruston know-how can cut *your* steam raising costs.



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IRON AND COAL
TRADES REVIEW

Vol. 180 May 20, 1960 No. 4,792

Growth of Steel Exports

MR. HEATHCOAT AMORY may become known to posterity as "the gentle Chancellor," or perhaps "the too gentle Chancellor." He pins his faith to the arts of persuasion in preference to the use of the bludgeon. Thus, in presenting his mark-time Budget, he warned the country of contemplated credit restraints which when the details were published a few weeks later fell so far short of expectations as to have inspired expressions of satisfaction in the circles financially affected.

Will the special deposits required from the clearing banks and the restoration of restrictions on hire purchase prove effective? Time alone will tell. If a negative answer be forthcoming the Chancellor has given a hint of a further tightening of the screw. His principal purpose is to reduce the use of physical and financial resources for the provision of supplies for the home market, thereby releasing greater capacity for the expansion of the export trade.

In this direction no British industry has achieved a more decisive advance than the steel trade. Last year, for example, Steel Review, the quarterly publication of the British Iron and Steel Federation, informed its readers, iron and steel manufactures and goods containing iron and steel represented 54.3 per cent. of this country's exports. Apparently, that preponderant percentage is still rising. Board of Trade returns for the first three months of this year reveal a 30 per cent. rise in the volume of iron and steel exports when compared with the corresponding figures for last year.

Over the full span of a generation, world exports have tended to be increasingly concentrated on steel-using goods, and it is illuminating to observe that the most buoyant markets for these exports have been found in the industrial countries, whose requirements have grown more rapidly than those of the primary producing countries.

We are not only gaining a stronger foothold in oversea steel markets; we are also exporting the "know how." At Durgapur, the first of the three new Indian steel plants, which has already begun production on a modest scale, the design and construction of the plant was entrusted to a British consortium: 350 technicians who hold key positions in the works are being given practical training in British steelworks, and to help to run the plant during the initial stages 90 technicians have already been seconded from the British steel industry.

Steel Review concludes that the export of whole industries, such as has happened at Durgapur, may well become more common in the next 50 years. India's gigantic efforts to make ample provision for the industrial needs of the great sub-continent do not run counter to the interests of British steel, which is still being shipped to India and Pakistan at the rate of over 300,000 tons a year.

A special section of the review is devoted to the shipbuilding industry, from which it transpires that British shipyards have about 2,000,000 tons of merchant ships under construction, which approximately equals the tonnage of British ships being built in shipyards oversea. There is no simple answer to the question "Why?" Why is it that 11 per cent. of the new ship construction in the United Kingdom is for foreign owners?

On balance, British shipbuilders are falling behind in the industrial race, and a writer in the review puts the bulk of the blame upon "the plague" of persistent stoppages. Millions of pounds have been spent upon the improvement of shipbuilding equipment and the improvement of techniques, but while foreign yards have been able to obtain the utmost benefit from investments of this character, the advantages in the UK are said to have been frustrated by "conservative" craft unions bringing work to a standstill over demarcation disputes or similar trivialities. It is a problem which the trade unions should ponder.

Whispering Campaign "Unfair to British Exports"

VISCOUNT DAVIDSON, president of the Engineering Industries Association, said at the association's conference in Scarborough last week that whispering campaigns by Britain's competitors in the export market were "very mischievous and unfair." In some of the largest countries of the world, he complained, it was whispered that Britain was second-rate and unable to deliver the goods because in a few years we would be unable to pay the workers to make the things we promised to supply.

If the firms could give delivery, and above all quality, they would be given the order even if their price were not as low as some of their competitors' prices, he said. They would certainly find this in some South and Central American countries. Lord Davidson recommended a co-operative sales organization to help smaller firms particularly.

OFFER of Newton, Chambers & Company, Limited, for the share capital of Ronuk, Limited, has been made unconditional.

Passing Thoughts . . .

ONE of our biggest difficulties is to persuade men not to take short cuts—a man at the coal face going too far before setting supports; a haulage worker from increasing the number of tubs in a train beyond that which is allowed; and a locomotive driver driving too fast. Miners, as in other walks of life, tend to think that accidents happen only to others, but they should think: "It can happen to me."—MR. H. J. PERRINS, HM Inspector of Mines and Quarries, North-Eastern Division.

Even the most foolproof safety precautions depend upon the conscientious performance of humdrum but indispensable duties. Ultimately the responsibility rests upon the managers of every pit and upon the men in them to recognize the vital importance of routine.—Glasgow Herald.

This decision [not to raise the salaries of president and secretary of the Amalgamated Engineering Union] shows contemptible meanness; it shows the Union as a deplorably bad employer; it also shows that this million-member union is not prepared to pay any reasonable price to have its affairs properly managed.—"OBSERVER" in the Financial Times.

In practice the apprentice often finds that "training" merely consists of doing the full job at cut rates, while narrowing differentials between skilled and unskilled workers have taken much of the glitter off the eventual prize.—Daily Telegraph.

Ten years ago M. Schuman's proposal did, after all, initiate a development which has put an end to the rivalry between France and Germany. It would have been surprising if there had been no growing pains.— The Guardian.

The announcement on page 1027 of the Board of Trade Journal of May 13 under the heading "Unwrought Aluminium Imports from the USSR" is an accidental repetition of an announcement made in October, 1958. The notice should therefore be disregarded.—Memorandum from the Board of Trade Journal.

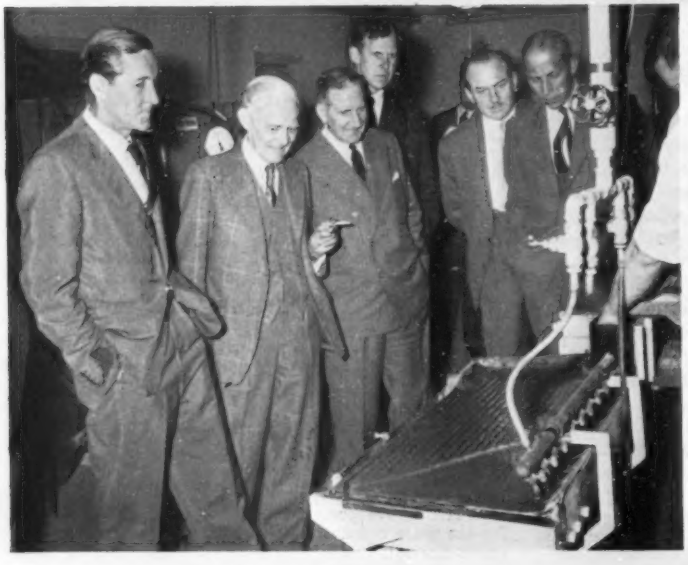
It has become common practice to denigrate nationalized industries and often too little is heard of the great schemes of reorganization and redevelopment which are being carried out. Nationalized industries would be heartened and stimulated if accorded a greater measure of fair play.—MR. WILLIAM E. WEBB, president of the British Gas Staff Association.

Two American tourists, Mr. and Mrs. Chester Jenks, arrived in Newcastle-upon-Tyne with small plastic bags of coal. They brought the coal from their home in Medford, Oregon, because having heard the expression "carrying coals to Newcastle" they wanted to say they had done it.—Report in the Daily Telegraph.

Industrial relations in the steel industry earn the rather grudging admiration of the industrial journalist. He admires them because they seem to be based on sanity, to avoid the sillier kind of strikes which are common in other industries, and yet manage to give the workers high average earnings. The admiration is a little grudging because both sides in the industry operate a conspiracy of near-silence against the press, holding that the spotlight of publicity will make their task more difficult.—The labour correspondent of The Guardian.

We should take an example from the Royal Family who use coal in Buckingham Palace.—SIR WILLIAM LAWTHER, ex-president of the National Union of Mineworkers.

ARUSHA INDUSTRIES, LIMITED—Mr. A. G. T. Cole has resigned from the board.



Mining Engineers Visit Kent Works of Fraser & Chalmers

A PARTY OF ABOUT 30 MEMBERS OF THE SOUTHERN COUNTIES INSTITUTE OF MINING ENGINEERS ON A VISIT TO THE FRASER & CHALMERS WORKS OF THE GENERAL ELECTRIC COMPANY, LIMITED, AT ERITH (KENT), RECENTLY. LEADER OF THE PARTY WAS THE INSTITUTE'S PRESIDENT-ELECT, MR. W. V. SHEPPARD, NATIONAL COAL BOARD DIRECTOR OF RECONSTRUCTION. AFTER A WELCOME BY THE MANAGING DIRECTOR, DR. K. J. WOOTTON, THE VISITORS SAW THE COMPANY'S PRODUCTION FACILITIES NOT ONLY FOR A WIDE RANGE OF MINING MACHINERY BUT ALSO FOR OTHER TYPES OF HEAVY ENGINEERING EQUIPMENT.

NCB MEMBERS TO RETIRE

Sir Joseph Latham and Mr. R. H. E. Thomas

SIR JOSEPH LATHAM

FORTHCOMING loss to the National Coal Board of two of its members was announced by the Ministry of Power yesterday (Thursday). Sir Joseph Latham, the board's deputy chairman, has informed the Minister of Power that for health reasons he does not wish to continue after the expiry of his present term of office and the Minister has agreed that he should retire on August 31, 1960. The other retirement is that of the marketing member of the board, Mr. R. H. E. Thomas.

Mr. Thomas informed the Minister that he did not wish to be reappointed for another full term of office when his previous appointment expired last February, but he agreed to continue for a short further period. He will be retiring on June 30.

The Minister has accepted both these retirements with great regret and has paid warm tributes to the distinguished and devoted services which Sir Joseph Latham and Mr. Thomas have rendered as members of the Coal Board during the last five years.

MR. R. H. E. THOMAS

Varied Interests

Sir Joseph, who is 54, has been associated with industry since 1935. He qualified as a chartered accountant in 1926 and was in practice for eight years before joining, as liaison officer, Lancashire Associated Collieries, the central coal-selling scheme for the district, on its formation in 1935.

He was appointed secretary of Manchester Collieries, Limited, in 1941 and elected to the board of the company in 1943. On nationalization he became director-general of finance of the NCB and served in this capacity up to the reorganization of the board in 1955 when he was appointed a full-time member. He became deputy chairman the following January when Sir (then Mr.) James Bowman succeeded the late Sir Hubert Houldsworth as chairman.

He is chairman of the Coal Industry Housing Association, deputy chairman of Coal Industry Nominees, Limited, and a director of Benzole Producers, Limited, and an original member of the Clean Air Council since its formation in 1957. He was made CBE in 1950 and knighted in the New Year Honours this year.

So far as his plans for the future are concerned, Sir Joseph has said that he hopes to do "part-time work with industrial interests."

Mr. Thomas, who was born on June 12, 1896, founded in 1921 the firm of Milner Thomas & Company, Limited, which later absorbed Peake, Oliver & Peake, Limited. Mr. Thomas was managing director up to 1946. He has been a member of several British distributive organizations including the Chamber of Coal Traders and he was vice-chairman of the distributors' section of the London and South Emergency Advisory Committee during the war.

When the NCB was reconstituted in 1955 Mr. Thomas became a member with functional responsibilities for marketing and purchasing and stores. He had been deputy director-general of marketing (commercial operations) since 1947 and he is also chairman of the Opencast Executive.

He, too, is a director of Benzole Producers, Limited, a member of the British Coking Industry Association, and a past president of the British Tar Confederation. He is a director of the Coal Industry Housing Association and of the National Industrial Fuel Efficiency Service.

DOMINOES FROM COAL FOR THE DUKE

SET of dominoes made of carbon, produced from coal, and inset with silver pips, was presented to the Duke of Edinburgh when he visited the British Coal Utilization Research Association's laboratories at Leatherhead last Friday. The dominoes, and the box containing them, were produced from coal by a process developed by the association.

During his visit, the Duke was told of the work of the association which links the four nationalized industries—the National Coal Board, the Electricity Council, the Gas Council, and the British Transport Commission—with private industrial appliance makers, coal distributors, and consumers.

Obituary

MR. S. J. REID

THE death has occurred of Mr. Stephen Jackson Reid, finance director of the Durham Divisional Coal Board until his retirement a month ago. He was 60. Mr. Reid, who served the mining industry with distinction for over 44 years, started his career as a junior with Pease & Partners, Limited, founders and former colliery owners, etc., of Darlington, and eventually became company secretary.

At vesting date, Mr. Reid was appointed finance director of the old Northern Division (Durham, Northumberland, and Cumberland) and since January 1, 1950, was finance director of the Durham Division. As joint honorary secretary of the Durham Divisional Welfare Committee, Mr. Reid took an active part in the provision of welfare amenities for mineworkers.

He was a member of the council of the North-east Coast Association of Chartered Secretaries and a Fellow of the Institute of Costs and Works Accountants. Mr. Reid was also a member of the Tyne Improvement Commission.

SIR JOHN STEPHENSON

THE death has occurred of Sir John Stephenson, chairman of the Eastern Gas Board from 1949 until last year. He was 72. Sir John began his career as an apprentice plumber and was a lifelong trade unionist. He was at one time general secretary of the Plumbers' Trade Union and was formerly president of the Confederation of Shipbuilding and Engineering Unions.

During the war he served in the Ministry of Aircraft Production and at the Board of Trade and at the end of the war became adviser to the Ministry of Aircraft Production. Sir John was a director of British Overseas Airways Corporation, and the Wholesale Coke Company, Limited, and a member of the Gas Council.

Mr. THOMAS MATTHEWS, a former miner, has died at the age of 103. He was the last survivor of the 1890 Morfa Colliery (Glam) disaster, in which 84 men lost their lives.

Mr. WALTER F. CRANE, chairman and managing director of Cranes (Dereham), Limited, makers of trailers, steel wheels, and axles, etc., of Dereham (Norfolk), died on Wednesday of last week. He was 77.

The death has occurred of Mr. FRANK LEE OWENS, for the past 28 years cashier in the Tyldesley, Manchester, offices of the National Coal Board. He was 62 and had completed 48 years' service in the mining industry.

The death has occurred of Mr. HENRY G. SMITH, chairman of George Hattersley & Sons, Limited, manufacturers of textile and weaving machinery, of Keighley (Yorks). He was 68 and had been a director of the company for nearly 50 years.

Founder and managing director of Robert Harris, Limited, engineers and press workers, of Wednesfield (Staffs), Mr. R. W. HARRIS, has died. He founded the company in 1944 and when it was taken-over by the Villiers Engineering Company, Limited, in 1956 he continued as managing director.

Mr. FREDERICK LESLIE SMITH, an electrical engineer in the No. 6 (North-West Durham) Area of the Durham Divisional Coal Board, has died aged 58. Mr. Smith started his career as an electrical engineer with the former Holmside & South Moor Collieries, Limited.

The death occurred recently of Mr. HERBERT BUTCHER WEBB, chairman of Joseph Webb & Sons, Limited, makers of forgings, etc., of Bury. Mr. Webb, who was 69, was the grandson of the founder of the firm and had been connected with it for 50 years. He joined the board nearly 40 years ago and became chairman in 1951.

Recent Wills

THOMAS, W. H., coal merchant, of Chiswick, London, W.4 ... ... £30,246

HOPKINS, ILLTYD, former miners' agent, of Aberdare (Glam) £40,224

KILKENNY, PATRICK, retired miner of Leazes, Burnopfield, Newcastle-upon-Tyne £12,387

WADE, CHARLES, director of Josiah Wade, Limited, printers' engineers, of Halifax £73,539

MOSZYNSKI, DR. Z. K. A., principal scientific officer of the British Coke Research Association ... £4,433

STOTHERT, W. A., governing director of H. Stothert & Company, Limited, coal wholesalers, of Cardiff Docks £25,300

RIGLEY, MRS. ELIZA, director of William Rigley & Sons, Limited, railway wagon builders, of Nottingham £17,648

DEWHURST, WILLIAM, engineering division's sales representative for Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield £3,896

HARRISON, E. R., chairman from 1931 to 1954 of the Rover Company, Limited, and a director of Kayser, Ellison & Company, Limited, and Walter Spencer & Company, Limited £87,789

BOTWOOD, B. A., former sales and service director of the Rover Company, Limited, managing director of Harry Ferguson, Limited, and one time managing director of Humber, Limited ... £32,046

ALLEN, H. G., deputy chairman and managing director of W. H. Allen Sons & Company, Limited, mechanical, hydraulic, and electrical engineers, of Bedford, until his retirement in June, 1959 ... ... £226,009

DAVIES, J. W., former director of the Hollinwood works of Ferranti, Limited, past president of the Manchester district of the Engineering Employers' Association, and a founder member of the Institution of Production Engineers £30,130

INTESTATE

MCWHINNIE, HERBERT, former general sales manager of the Steel, Peech & Tozer branch of the United Steel Companies, Limited, Rotherham (Yorks), a member of the National Billet Association and a former chairman of the Billet Prices and Extras Committee £4,926

Trimmer's Mystery Death in Steelworks

YOUNG steelworker somehow fell into an ore-carrying skip and was taken to the top of a blast furnace at the Margam Works of the Steel Company of Wales, Limited, the West Glamorgan coroner, Mr. Ian Cameron, was told at an inquest on Tuesday. The coroner recorded a verdict of Accidental Death on Mr. Thomas John Trent (24), who died of carbon monoxide poisoning when his body was carried into a sealed gas-filled chamber at the top of the furnace.

On the day of the accident, it was stated, Mr. Trent was seen by fellow bunker trimmers pushing a barrow towards the chute. He was missed a few minutes later and his barrow was found lodged in the chute. The operation of the furnace was immediately stopped and Mr. Trent's body was found lying face downwards in the second bell.

European Energy Needs

COAL AND OIL WILL NOT BE ENOUGH

EUROPE'S urgent need to unite to keep pace with Russian and US technological progress was stressed on Monday by M. Etienne Hirsch, Euratom president, in an address to the Parliament of the European Communities in Strasbourg. He estimated that in the next 20 years Europe's energy needs would rise from 460,000,000 to 800,000,000 tons of coal equivalent. Neither coal nor oil would be sufficient to cover this increased demand, he said, and a major effort in the nuclear power field was needed.

M. Hirsch went on: "By 1980, the community will have to have at its disposal an installed nuclear electrical capacity of over 40,000 megawatts, corresponding to more than 250 units of 150 mW." This target could be reached only if constructors got down immediately to building full-scale power plants.

Deploring the tendency shown by Governments of the Six to concert their attitudes towards problems affecting the European institutions without reference to their independent executives, M. Hirsch said that these difficulties would not be fully resolved until political integration was achieved. "Just as there is a single Parliament and one Court of Justice for the three communities, so also must there be brought into being, with the minimum of delay, one single executive."

"Long-term Need"

M. Hirsch has since replied to critics in the Assembly that his forecast of nuclear energy supplies in Western Europe was over-optimistic. He claimed that "provided the cost of nuclear energy has been reduced by 20 per cent. meanwhile, we shall have a competitive source of power by 1970." He also said he had received an undertaking from the French Atomic Energy Commissariat that it would pass on to Euratom information received from the Soviet Government under the terms of the Franco-Russian nuclear energy agreement concluded during Mr. Khruschchev's visit to France last month.

Reference to Britain's need for nuclear power was also made on Monday by Mr. F. H. S. Brown, deputy chairman of the Central Electricity Generating Board, in a lecture to the Royal Society of Arts, in London. Mr. Brown said that the necessity was a long-term one but that nuclear power was at the moment marginally uneconomic.

Development was already reducing costs of nuclear power stations, he said, to a point where they were in sight of becoming competitive with coal, and there was a reasonable prospect that by about 1970 such a station would produce cheaper units than a coal-fired station. But until their capital cost could be substantially reduced relative to coal-fired stations, nuclear stations must enjoy a high load factor throughout their expected life. He advised that nuclear power stations should be sited preferably in coal-deficit areas, which meant, broadly, in the south of the country or in the north-west.

Referring to the use of oil, Mr. Brown said this was filling what was thought to be a temporary gap between the availability of home produced coal and nuclear energy.

Shipbuilding Time Halved at Walker Yard

COMMENTING on the record rate of construction of the 8,500-ton d.w. liner Lobito Palm by the Walker shipbuilders, Swan, Hunter, & Wigham Richardson, Limited, the chairman, Mr. E. J. Hunter, said it showed the measure of improvement which had resulted from modernization and improved methods of production. A similar ship built at the yard in 1955 had spent 49 weeks on the building berth; the Lobito Palm spent only 20 weeks. In effect, over the last five years building time had been more than halved.

"It is a measure also of the co-operation that we are receiving from our workpeople in introducing modern techniques, because in the depressed state of world shipping today it is only by using the best equipment to its best advantage that further work can be obtained and employment for all our workpeople ensured," Mr. Hunter added.

The Lobito Palm, the ninth ship to be built at the Neptune Yard for the Palm Line since 1955, was launched on Thursday of last week.

Hepworth & Grandage to Expand in North-east

NEW plant is to be established in Sunderland by Hepworth & Grandage, Limited, motor component makers, of Bradford. The plant will be on a 20-acre site and initially will provide jobs for some 120-200 people. Later, however, there may be work at the plant for as many as 1,000.

The company plans first to erect a foundry to produce castings for machining in Bradford. Eventually some machining may also be done at the Sunderland plant, which will be an addition to existing capacity, since there is no intention of moving any work from Bradford. Hepworth & Grandage, a member of the Associated Engineering group, specializes in pistons and piston rings. Expansion at its main Bradford works is limited because of labour shortage.

NATIONAL UNION OF MINEWORKERS has recommended Areas to support the nomination of Mr. George Woodcock as general secretary of the TUC in succession to Sir Vincent Tewson, who retires in the autumn. It is the first big union to announce its choice.

Personal

Midland NACM's New President

MIDLAND branch of the National Association of Colliery Managers has in Mr. THOMAS RAINE JAMESON a president who has not only spent over 40 years in the industry but is the son of a mining surveyor and engineer. Mr. Jameson was elected president on Monday of last week.

MR. T. R. JAMESON

Born on September 14, 1902, Mr. Jameson was educated at the North of England Counties School, Barnard Castle, and Pannal Ash College, Harrogate, and received his technical training at Nottingham University, and Mansfield and Chesterfield technical colleges. He became an articled student with the Blackwell Colliery Company, Limited, in April, 1919, under the late Mr. J. T. Todd, served in the surveying and engineering departments, and later was a junior official in various capacities at the company's five collieries.

Mr. Jameson was appointed undermanager at "A" Winning Colliery in 1936 and manager in 1942, and then went to Brookhill Colliery as manager in 1951. He was appointed manager of Bentinck Colliery in 1956 and became agent/manager 15 months later.

Dr. H. J. KING, senior lecturer in the Department of Mining at Leeds University, is to be promoted to the title and status of Reader.

Dr. R. B. NICHOLSON has been appointed demonstrator in the Department of Metallurgy, Cambridge University, with a tenure of three years from October 1.

Training officer at Bilsthorpe Colliery (Notts), Mr. E. A. KNIGHT has retired. Mr. Knight moved to Bilsthorpe from Grassmoor Colliery (Notts) in 1928 and became a pit deputy in the same year. He was later appointed overman.

Former manager of Adventure Colliery, West Rainton (Co. Durham), Mr. THOMAS CHARLES COOK has retired from Houghton-le-Spring bench on reaching the age limit of 75. Mr. Cook retired from the mining industry nine years ago.

Mr. J. A. BAUSCHER has joined the Lee Wilson Engineering Company, Incorporated, USA, as vice-president in charge of research. Before taking up this appointment, he was chief of the sheet products division of the applied research laboratory of the US Steel Corporation.

Lord DALTON received a presentation from miners in his constituency at a dinner last weekend given by the Bishop Auckland and District Miners' Federation Board. The gift was a tribute to his long service as MP for the division before he was raised to the peerage.

Among the guests at a small informal luncheon party given by the Queen and the Duke of Edinburgh at Buckingham Palace on Wednesday was Mr. P. J. C. BOVILL, the Master Cutler, who is managing director of Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield.

Two-day visit to the Durham coalfield was begun yesterday (Thursday) by Mr. J. C. GEORGE, Parliamentary Secretary to the Ministry of Power. He met members of Durham Divisional Coal Board and trade union representatives and visited the Murton coke oven plant and associated collieries. Today he is due to go underground at Craghead Colliery, near Stanley, and make a surface tour of the Morrison Busty Colliery, Annfield Plain, and Fenhall Drift, Lanchester.

Prof. Whetton to Retire from University Post

PRESENTATION fund is to be opened for Prof. J. T. Whetton, who at the end of the current session retires from the chair and headship of the Mining Department of Leeds University, to which he was appointed in 1945. Prof. Whetton received early training in the Yorkshire coalfield and after distinguished service in the first world war, resumed mining studies at Leeds University.

PROF. J. T. WHETTON

In 1923, he was appointed to the academic staff of King's College, Durham University and until 1939 was in turn research assistant, lecturer, and Reader. After serving, again with distinction, in the last war, Prof. Whetton was appointed to his present post and under his direction the department has undergone a steady expansion.

Prof. Whetton was Pro-Vice-Chancellor of the University from 1955 to 1957, was President of the Old Students' Association for seven years and Chairman of Convocation for three years. He is a council member of the Institution of Mining Engineers, and the Midland Institute, of which he is also president-elect. Prof. Whetton has travelled extensively in the interests of mining, and earlier this year toured Canada and the USA as a Nuffield Foundation and Research Council lecturer. He is a member of the International Mining Committee.

Nearly 100 publications bear his name and include subjects such as applied geophysics, prospecting, boring, sinking, skip winding, stowing, ground movement, survey correlation, and the inflammability of coal dusts.

In the 1914-18 war, Prof. Whetton was awarded the Military Cross and the Russian Order of St. Stanislav, and in the last war he received the DSO, the Belgian Order of the Crown, and the Croix de Guerre and was made an OBE.

The presentation fund is being opened to mark his retirement at the age of 65, and it is felt that many old students of the universities of Durham and Leeds and friends and colleagues in many countries would like to contribute to it. Those wishing to subscribe are invited to send their contributions in the name of the "J. T. Whetton Presentation Fund" and address them to Mrs. J. W. Durham, Secretary, Department of Mining, The University, Leeds, 2.

Recruitment of Boys

NORTH-WESTERN DIVISION LIFTS RESTRICTIONS

RESTRICTION on the number of boys recruited into the mining industry in Lancashire and North Wales has been lifted after two years. The North-Western Divisional Coal Board, which covers both coalfields, is seeking more than 800 physically fit boys aged 15 to 17½ to meet the greatly expanded target of 1,100 boy entrants this year. Only a few boys have been taken at school-leaving periods since the restriction came into effect.

The division wants mining trainees, and apprentices who will become colliery tradesmen. The mining trainees receive a 16-week training course before entering the pits. Apprentices are selected from the mining trainees and have a full five-year course. The greatest intake, of a further 400 boys, is planned for the 12 pits forming the St. Helens Area, one of the most mechanized Areas in the country, with 75 per cent. of its coal output power loaded. Preliminary training is at the Old Boston Training Centre, Haydock, where a new £30,000 training school for apprentices has opened, and at the St. Helens Technical College. So far 70 boys have been recruited this year in the Area.

Boys in the Manchester and Wigan Areas are trained at St. George's Training Centre, Tyldesley, where another 170 boys are wanted this year. The centre has already recruited 104. The Burnley Area plans to take 160 more boys this year for its centre at Bank Hall and the North Wales Area wants 75 more boys to train at Gresford.

A divisional spokesman commented: "The industry can offer a secure and interesting future and there are many completely modernized long-life pits in Lancashire and North Wales. As the miner is now relying less and less on his pick and shovel, plans are being prepared to give a certain amount of mechanical and electrical training to all boys."

Miners Help in New War Against Pneumoconiosis

ABOUT 175 Welsh miners have volunteered to take part in a year's medical trial in a new effort to cure pneumoconiosis with powerful antibiotics which are successful against tuberculosis. The miners—all victims of the dust disease and still working in the pits—are being admitted to Talgarth Hospital, Breconshire, for three months' treatment. The treatment will then continue at home for nine months, during which time the men can resume work.

The experiment is jointly arranged by the Medical Research Council's pneumoconiosis unit at Llandough Hospital, near Cardiff, with the help of the Welsh Regional Hospital Board, the National Coal Board, and the National Union of Mineworkers. It is not yet known whether the drugs will cure or even arrest pneumoconiosis.

While they are receiving treatment the miners have been assured by the NCB that they will be paid their full average earnings.

Future Use of Coal for Electric Power

AT the present rate of increase in the transmission of energy, in less than 20 years the whole of the National Coal Board's output would be consumed in the output of electricity, said Sir Josiah Eccles retiring president of the British Electrical Development Association at its annual luncheon in London last week. He said that Britain used about 46,000,000 tons of coal, or coal equivalent, a year to produce electricity.

In the future the electricity industry would also use two other fuels. It would be quite a task, he said, for the fuel industries and the Government to achieve four times the present electrical output, but it would come.

Mr. Richard Wood, Minister of Power, spoke of the astonishing increase in electrical development over the past 10 years, and said that the proportion of fuel consumed in the electrical form had moved from between one sixth and one seventh in 1949 to a quarter 10 years later. Mr. Wood added that the new power stations built in post-war Britain had played a part in preventing the cost of electricity rising nearly as fast as most of the other principal raw materials of industry.

At the annual meeting, Sir Edwin Herbert succeeded Sir Josiah Eccles as president for 1960-61. Mr. D. B. Irving, chairman of London Electricity Board, was elected chairman of the council.

Durham Divisional First-aid Winners

MORE than 700 miners, supporters, and officials of the National Coal Board attended the finals of the Durham Divisional Coal Board's annual first aid competition at Durham on Saturday. Eppleton Colliery won the senior team test, the mining practice award, and also provided the individual prizewinner, Mr. J. McDermott.

Results.—Seniors: 1 Eppleton, 472 points; 2 Crookhall, 449; 3 Dean & Chapter A, 402. Individual: 1 J. McDermott; 2 R. Pearson, 3 J. L. Trotter (all from Eppleton). Coke oven and ancillary plant workers: 1 Brancepeth, 453¾; 2 Norwood, 419¼; 3 Tursdale Workshops, 418. Individual: 1 W. Davies (Brancepeth), 2 J. P. Conn (Tursdale); 3 J. A. Sparkes (Brancepeth). Juniors: 1 Thristlington, 454; 2 Crookhall 451¼; 3 Wearmouth, 430. Individual: 1 G. Bowerbanks (Thristlington); 2 A. Errington (Chester South Moor); 3 T. Turnbull (Wearmouth).

Orders Placed

GEC to Supply Vacuum Furnace for Research

ORDER for a vacuum melting and casting furnace for use in the Sheffield experimental foundry of the British Steel Castings Research Association has been placed with the General Electric Company, Limited, in association with Vacuum Industrial Applications, Limited, Wishaw (Lanarkshire). With a chamber 36in. in diameter and mounted horizontally, the furnace will be for research into the melting and casting of steels under vacuum, and can melt 56 lb. of steel. The working pressure of the furnace chamber is 1 micron Hg, giving a working temperature of up to 1,700 deg. C. The melt is poured by rotating the crucible unit about its lip axis.

Alloying additions are carried in six tipping buckets in the top of the chamber and fed to the crucible by a removable chute. The appropriate addition is selected by a rotary indexer. The chamber is evacuated by a two-stage pumping system comprising an oil booster-diffusion pump backed by a gas-ballasted rotary pump.

Another order, worth nearly £100,000, secured by GEC in association with Vaccum Industrial Applications, and also the British Geco Engineering Company, Limited, is for the supply of an induction melting furnace of 1-ton capacity for the Brightside Works, Sheffield, of Jessop-Saville, Limited. It is believed to be the largest furnace of its type being made in this country.

CONTRACT for a lime-soda plant at Linby Colliery (Notts) has been awarded to William Boby & Company, Limited, water treatment engineers, of Rickmansworth (Herts). The order is worth £3,595.

THE ADMIRALTY has ordered 40 self-regulating 500 kVA transformers from Foster Transformers, Limited, a member of the Metal Industries, Limited, group. The contract is worth £64.000 and first deliveries will be made early in August.

CONTRACT for polyolefines plants and off-site facilities for the Shell Chemical Company, Limited, at Carrington, near Manchester, has been awarded to Matthew Hall & Company, Limited, chemical and industrial engineers, of London, N.W.1. The contract is valued at £5,500,000.

ORDER for a 15,000-ton ore carrier has been placed with Bartram & Sons, Limited, Sunderland, by the West Wales Steamship Company, Limited. The vessel will be powered by a four-cylinder Doxford-type engine supplied by the North Eastern Marine Engineering Company, Limited, Wallsend-on-Tyne.

A FURTHER ORDER has been received by Bray Construction Equipment, Limited, for an additional 14 tractor shovels, to the total value of £48.000, for export to Sweden. The order has been placed by its agents, R. A. Dahlgren, Limited, of Lidkoping, and follows the recent dispatch of 10 similar shovels.

ANOTHER 3.000 kW diesel generating set has been ordered by Jersey Electricity Company, Limited, from Mirrlees, Bickerton & Day, Limited, Stockport, a member of the Hawker Siddeley Group, Limited. The equipment comprises a Mirrlees KVSS16-type, 16-cylinder engine developing 4,128 BHP, directly coupled to an 11,000-volt alternator made by Brush Electrical Engineering Company, Limited, another member of the group. The Isle of Man Electricity Board has also placed a repeat order on Mirrlees for a 2,200 kW diesel generating set embodying the 3,096 BHP Mirrlees KVSS12-type 12-cylinder engine directly coupled to an 11,000-volt Brush alternator.

CONTRACTS FOR vegetable oil mill machinery for Gambia and the West Indies, and a solvent extraction plant for Kenya have been placed with Rose, Downs & Thompson, Limited, Hull, a member of the Power-Gas group. The oil mill contracts, worth nearly £200,000, both incorporate refining and deodorizing equipment. The order from Kenya, valued at about £160,000, is for a complete plant to recover crude pyrethrin extract from pyrethrum flower heads. It is the second installation the company has supplied to this client, incorporating a rotary continuous solvent extraction unit.

Newton, Chambers' Engineering Profit

DESPITE continuing reduced demand for capital plant by the basic industries, a record turnover and profit is shown by the engineering division of Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield. The chairman, Sir Peter Roberts, states that the results were largely due to the diversification of the division's activities, made possible by the re-equipment and extension programme. There was also a marked increase over 1958 in the turnover of the excavator division.

Sir Peter says that expenditure on new buildings and plants was lower than in 1958 and totalled £486,000, of which £258,000 was spent at Thorncliffe and £228,000 at Waterside Works, Ipswich. At the end of 1959, the group was committed to further capital expenditure of £866,595 and it was expected that more than £1,000,000 would be spent in 1960.

The group's gross trading profit, before charging depreciation, was £1,466,671 compared with £1,293,926. The improved trading position justified an increase in the dividend from 16 per cent. to 17½ per cent., so a final of 11½ per cent. was recommended.

Toledo Woodhead (Springs) Extends Output Range

FREEHOLD plant and inventory of the light coil spring section of John Spencer & Sons (1928), Limited, at Newburn-on-Tyne, has been acquired for a cash sum by Toledo Woodhead (Springs), Limited, Aycliffe and Sheffield. A new company has been formed, and the light coil spring business will be carried on as an entirely separate concern under the title of John Spencers (Light Springs), Limited. The directors are Mr. Frank Woodhead and Mr. Harry Spittlehouse and continuity will be maintained by the retention of existing staff with Mr. A. H. Bantham as general manager.

The Newburn factory, which is modern and well equipped, produces varieties of coil springs from the lightest required in industry up to springs of 4 in. to 5 in. diameter. Toledo Woodhead also now makes springs down to this size and its development will enable the combined enterprise to offer a complete range of coil springs from the smallest to those suitable for commercial vehicles and tank suspension units.

AS FROM June 1, the telephone number of the Liverpool branch of British Insulated Callender's Cables, Limited, will be Maritime 2424.

African Notes

STEEL IN SOUTH AFRICA

Good Supporting Industry Needed

SOUTH AFRICA needs a good supporting steel industry with its smelting and rolling facilities, said Mr. D. Gordon Jones, chairman of the base metals division of the South African Institute of Mining and Metallurgy. Speaking at the division's recent annual meeting, Mr. Jones said that chromium was plentiful and there was sufficient local nickel to produce 25,000 tons of austenitic steel a year. Resources, he went on, were sufficient, in fact, for a combined annual output of austenitic and ferritic steel of about 60,000 tons.

He added that there was enough electrolytic manganese available as a by-product of uranium if the 200 series were to be produced. At the moment there was a market for about 2,500 tons of steel, but consumption would increase rapidly as living standards improved. "It is in the domestic field that application is increasing rapidly," said Mr. Jones.

Earlier, Mr. Jones reminded his audience that the only stainless steel castings produced in the Union were by such firms as the Union Steel Corporation (of South Africa), Limited, of Vereeniging, and Scaw Metals, Limited, of Johannesburg. South Africa imported about 2,500 tons of stainless steel a year for her uranium, chemical, oil, paper, and other industries.

Steel to Sheffield

Coinciding with this statement is the news that the Union Steel Corporation—South Africa's second biggest producer—has exported a small quantity of steel to Sheffield. The order comprised 35 tons of nickel-chromium steel and 35 tons of carbon-chromium steel 3-in. square billets, both sent from the Klip works. The Corporation's Vaal works have sent 2,600 short tons of special steel billets to Argentina in one month.

An electronic four-digit tub counter has been developed in the electronic workshops of Kerry (Pty.), Limited, of Johannesburg. Several collieries in Transvaal and the Orange Free State have already been equipped with the counter.

The overall quantity of coal moved from collieries by South African Railways last year was 21,471,135 tons, a drop of 80,679 tons on the 1958 figure. Rail movements from Transvaal collieries, at 17,823,226 tons, improved by 32,549 tons, but in Natal the total of 3,647,909 tons represented a drop of 113,228 tons.

South Africa is to export 50,000 tons of anthracite duff to Buenos Aires to power the new San Nicolas power station nearby.

An investigation of the iron-ore deposit at Nimba in Guinea is to be undertaken jointly by the United States Steel Corporation and the Japanese Kinoshita Shoten group. This deposit, which could be the richest in the world, is thought to contain at least 25,000,000,000 tons of iron ore.

James Barwell (South Africa), Limited, which owns the largest mechanized foundry in southern Africa, is to carry out a £250,000 modernization scheme at its Alberton (Transvaal) works. This step is designed to bring its works into line with the most advanced foundries in the world and to increase capacity by about 20 per cent. and efficiency by 15 per cent.

The installations will include hot blast cupolas, completely mechanized materials handling, a moulding unit capable of 150 boxes an hour per machine, and an automated cores shop.

Besides supplying castings to South African Railways, Escom, and a wide range of components to many of the country's biggest industries, the firm is licensed to produce SG iron, the factory being the largest producer of small (from ¼ lb. to 300 lb.) iron castings in the world.

The Mine Safety Appliances Company is building a new factory at Baragwanath, Johannesburg, for the production of miners' cap lamps, industrial gloves, ventilation tubing, and roof bolts. The company's head office is in Pittsburgh, US.

Inco to Work New Deposits

NEW mining operation, the Clarabelle Open Pit, is to be started by the International Nickel Company of Canada, Limited, on an outcropping orebody in the Clarabelle and Lady lakes area. The ore produced will be of low grade, but improved open pit mining methods and advances in metallurgical processes will justify its exploitation. Since production from the new workings is intended to replace tonnages from other Inco mines, the overall tonnage will not be increased.

The company is also to sink a shaft to the north of the workings for the exploration at depth of the geological formation known as the Copper Cliff Offset. This programme will necessitate the installation of surface plant including a hoist, compressors, and other equipment, together with a changehouse and shops facilities.

CAPITAL of Le Nickel, the French metal concern, is to be raised from NF55,660,000 to NF77,490,000 by the issue against cash of new NF50 shares at the rate of one new share for two old. Net profits increased sharply from 182,900,000 old francs to 334,800,000, and the net dividend of NF2.28 compares with 1.50 previously.

"Coking Plants Will Be Needed"

EXCELLENT future for the carbonization department in South Wales and mining generally was forecast by Mr. A. Walsh, deputy chairman of the South Western Divisional Coal Board, during the week-end. Mr. Walsh was presenting trophies and prizes at Pontypridd after the divisional first-aid competition for carbonization, engineering, and other plants.

He said that some people were perturbed about the future of the carbonization department because the stocks of coke in the division totalled almost 500,000 tons and in the whole country about 5,000,000 tons. "We have no apprehension whatever about the stocks," he went on. "We shall need them all in the next three or four years and there is not the slightest doubt that the carbonization department in South Wales, and mining generally, has an excellent future."

Competition results were.—1 Tredomen Engineering Works, 428 pts.; 2 Nantgarw Coke Works, 347; 3 Phurnacite Plant I, 333; 4 Caerphilly Tar Plant, 291; 5 Phurnacite Plant II, 282; 6 Cwm Coke Works, 261. Tredomen also won all individual prizes.

ICI May Exclude Wildcat Strikers from Profit Share

SUGGESTION that unofficial strikers at Imperial Chemical Industries, Limited, might be excluded from the company's profit-sharing scheme has been made by Mr. S. P. Chambers, chairman. An unofficial strike at the Wilton works last March involved about 1,000 members of the Amalgamated Engineering Union and at one stage threatened to shut factories.

In a review of the company's 1959 results, at a meeting of the ICI central council, reported in ICI's Wilton Works newspaper, Mr. Chambers claimed that interruption of production could make heavy inroads into the profitability of plants. The question must clearly arise, he said, whether, in future, the company was justified in including in the scheme for any year those people who, by unconstitutional action, had reduced the profit which would otherwise be available to all employees. No decision had been made about the matter, but it required consideration, he said.

Pit Firemen Compete

NINE colliery fire brigades from No. 6 (Bestwood) Area of the East Midlands Divisional Coal Board took part in the Area's fire-fighting competition at the Area training centre, attached to Hucknall No. 1 Colliery on Saturday. More than 100 colliery firemen competed.

Results.—Surface team test: 1 Gedling; 2 Hucknall; 3 Bestwood. Underground team test: 1 Babbington; 2 Gedling; 3 Bestwood. Individual surface test: 1 P. Ulyett (Hucknall); 2 R. Thacker (Calverton); 3 R. Jackson (Babbington). Individual underground test: 1 B. Chetwynd (Hucknall); 2 A. Brandreth (Clifton); 3 W. Brierley (Babbington).

INDUSTRIAL GALLERY was opened at the National Museum of Wales in Cardiff on Wednesday of last week. It aims to provide a record of technical progress in Wales and its influence on the life of the people.

European Coal Output

THE appended figures relating to coal output and imports are taken from statistics issued from Geneva by the Coal Committee of the Economic Commission for Europe.

Tonnages are metric, and the number of underground workers employed relates approximately to the end of the month.

TABLE 1.—*European Coal Output (Metric Tons) and Employment.*

Country.	Output.		Underground employment.	
	February, 1960.	January, 1960.	February, 1960.	January, 1960.
Belgium	1,926,000	1,904,000	90,000	89,000
France	4,980,000	4,229,000	135,000	135,000
Italy	61,000	62,000	—	—
Netherlands ..	979,000	997,000	29,000	30,000
Poland	8,639,000	8,311,000	—	213,000
United Kingdom ..	16,633,000	16,558,000	502,000	507,000
Western Germany ..	11,721,000	12,300,000	—	—

TABLE 2.—*European Solid-fuel Imports in February, 1960, with Figures for January, 1960, shown in Brackets (Metric Tons).*

Importing country.	Coal and patent fuel.	Coke.	Lignite and brown coal briquettes.
Austria	281,000	53,000	53,000
	(298,000)	(60,000)	(57,000)
Belgium	323,000	22,000	6,000
	(284,000)	(17,000)	(8,000)
Denmark	338,000	126,000	16,000
	(462,000)	(157,000)	(22,000)
Finland	150,000	15,000	—
	(122,000)	(8,000)	(—)
France	916,000	405,000	26,000
	(857,000)	(420,000)	(26,000)
Greece	7,000	—	—
	(16,000)	(2,000)	(—)
Eire	137,000*	—	—
	(145,000)	(1,000*)	(—)
Italy	939,000	8,000*	8,000*
	(835,000)	(15,000*)	(11,000*)
Luxembourg	22,000	340,000	9,000
	(25,000)	(349,000)	(11,000)
Netherlands	581,000	43,000	25,000
	(568,000)	(48,000)	(17,000)
Norway	27,000*	20,000*	—
	(23,000*)	(22,000*)	(—)
Portugal	37,000	5,000	—
	(24,000)	(2,000)	(—)
Sweden	131,000	103,000	2,000
	(219,000)	(150,000)	(5,000)
Switzerland	150,000	34,000	17,000
	(100,000)	(16,000)	(15,000)
United Kingdom	—	—	—
	(—)	(—)	(—)
Western Germany	440,000	38,000	499,000
	(374,000)	(31,000)	(526,000)

* Secretariat estimate.

Transferred Miners' Request for Free Transport Refused

DISPUTE over the transfer of miners from Seaton Delaval Colliery (Northumberland), due to close next Friday, has arisen between the Northern (N&C) Divisional Coal Board and the local branch of the National Union of Mineworkers. The branch insists that the 70 men transferring to other pits should have free transport to and from work, but the board has rejected the suggestion.

Of the remaining employees at Seaton Delaval, 90 will be retained temporarily on salvage work and 160 will become redundant. The present manager, Mr. E. Metcalfe, is being transferred to Horton Grange Colliery on June 1.

Control Factors in Mine Management

Steps taken to establish a control system covering overtime, materials, and piecework earnings at Brookhill Colliery, East Midlands Division, National Coal Board, are described in this paper presented to the Midland Branch of the National Association of Colliery Managers on January 18, 1960. *The improved control of materials during 1959 resulted in the saving of £17,240 compared with 1958. To help in effecting control of these important cost items, a card index system has been established to provide a ready reference of broad information indicating to the colliery manager where action is necessary.*

By S. VARDY, B.Sc.(Hons.)*

AFTER nationalization, the mining industry was faced with markets which were ever expanding. The demand for coal was such that management at all levels devoted the maximum attention to obtaining the last ton of coal. Some two to three years ago conditions changed, and it became clear that it was more than necessary to give greater attention to the more effective control of costs. Although it is not possible to deal with all the measures taken at Brookhill Colliery in the No. 4 Area of the East Midlands Divisional Coal Board, the control measures outlined for overtime, materials, and piecework earnings, are presented in chronological order as they were put into operation from September, 1958.

The first system of control was that dealing with overtime, and it has been in operation at Brookhill since October, 1958, where it has proved its effectiveness and at other collieries to which it was later extended.

It was the object of the system to control overtime within a maximum level of 7 per cent. of ordinary shifts worked in any week as determined by Area policy. This excluded weekly paid industrial staff, and under-officials. The colliery manager was also kept aware of the position at any stage in the week, and the system defined the responsibility for any deviations from agreed levels and the cause of the deviations. Also information was presented to the colliery manager and departmental heads in such a form as would be readily understood, limited in quantity, yet of such a nature that action could be initiated.

It was appreciated that for the system to be practical it should be flexible, and able to cater for:—(*a*) Uneven overtime requirements of different departments; (*b*) the fact that if a percentage of ordinary shifts is intended to remain at a constant level, then the overtime shifts must move in sympathy with the ordinary shifts as attendances vary, and (*c*) changes in manpower and methods of working, making it necessary for there to be a constant review of overtime requirements.

* Manager, Brookhill Colliery, No. 4 Area, East Midlands Divisional Coal Board.

Installation of the System

In installing the system for the control of overtime, the departmental responsibilities were clearly defined according to Table 1.

TABLE 1.—*Departmental Organization for the Control of Overtime.*

Undermanager "A."	Undermanager "B."	Enginewright.	Chief electrician
Responsible for Low Main and Blackshale seams: (*a*) Faces; (*b*) Districts and main roads; (*c*) Development; (*d*) Pit bottom.	Responsible for Piper Seam: (*a*) Faces; (*b*) Districts and main roads; (*c*) Development.	Responsible for: (*a*) Surface; (*b*) Underground mechanical maintenance and installations.	Responsible for: Surface and underground electrical maintenance and installations.

Each departmental head was then charged with the responsibility of preparing overtime budgets for his department in respect of basic mid-week requirements, and basic weekend requirements for statutory cover and essential routine duties.

The colliery manager then reviewed the budgets in conjunction with the departmental heads, and, after consideration and adjustment, agreement was reached on the finalized essential routine overtime requirements.

It was interesting at this stage to note that the total of overtime budgeted shifts submitted by the various departments was 214, which represented 5.53 per cent. of the average normal shifts, excluding weekly paid industrial staff and under-officials. This left 1.47 per cent. of normal shifts, or 57 overtime shifts per week as the absolute limit for additional work requirements. The 57 shifts were then distributed over the departments after consideration of jobs on hand, etc. The final total was therefore 271 shifts, or 7 per cent.

TABLE 2.—*Summary of Overtime Shifts Worked for Week Ended May 2, 1959.*

—	Face.			Elsewhere underground.		
	Budget.	Actual.	Cumulative saving or excess (+)	Budget.	Actual.	Cumulative saving or excess (+)
Saturday noon-end to Sunday night shift	Nil	Nil	—	2	1	1
Saturday noon-end to Monday night shift	1	1	—	6	9	3+
Saturday noon-end to Tuesday night shift	3	2	1	10	18	8+
Saturday noon-end to Wednesday night shift	5	5	—	15	25	10+
Saturday noon-end to Thursday night shift	7	9	2	20	27	7+
Saturday noon-end to Friday night shift	8	9	1+	25	31	6+
Saturday noon-end to Saturday noon	8	9	1+	38	34	4

Actual Overtime Shifts Worked.

Description.	Cost code.	Saturday.		Sunday.		Monday.		Tuesday.		Wednesday.		Thursday.		Friday.		Sat.
		A.	N.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.
21's face	1A	—	—	—	—	—	—	2/15	—	—	12/15	4/15	—	—	1 1/15	—
22's face	1A	—	—	—	—	4/15	—	9/15	—	—	—	—	—	2	6/15	—
23's face	1A	—	—	—	—	—	—	—	—	1	12/15	—	—	8/15	—	—
24's face	1A	—	—	—	—	12/15	—	—	—	—	4/15	—	—	—	—	—
25's face	1C	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Face development		—	—	—	—	1 1/15	—	—	—	1	12/15	4/15	—	2 8/15	1 7/15	—
Total Face ..		—	—	—	—	1 1/15	—	11/15	—	1	1 1/15	4/15	—	—	8 14/15	—
	—	—	—	—	—	1 1/15		1 12/15		4 10/15		4 14/15		8 14/15		8 14/15
Development of roadways ..	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
District transport (conveyor operators), supplies, spillage	3A	—	—	—	—	8/15	—	4/15	4/15	6/15	8/15	4/15	4/15	8/15	5/15	—
Cables	3A	—	—	—	—	5 5/15	—	5 5/15	—	5 4/15	—	1 1/15	—	1 13/15	—	—
Switches	3A	—	—	—	—	1	—	2 1/15	—	—	—	—	—	—	—	—
Main roads (conveyor operators), spillage, supplies	3B	—	—	—	—	2/15	—	—	—	—	—	2/15	6/15	4/15	4/15	—
Roadway repairs	4	—	—	—	—	8/15	8/15	8/15	8/15	8/15	8/15	—	1/15	—	1/15	—
Bell repair	6	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1 6/15
Booster fan	9	—	—	—	—	3/15	—	—	—	—	—	—	—	—	1/15	—
Surveying	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1 5/15
Dinting	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total Elsewhere Underground	—	—	—	—	1	7 11/15	8/15	—	8 3/15	4/15	—	6 3/15	1 1/15	4/15	1 3/15	11/15	3/15	2 10/15	10/15	1/15	2 10/15
		—	—	—	1	9 4/15		17 11/15		25 4/15		27 6/15		30 12/15		33 7/15

of the average ordinary shifts worked per week of 3,870.

Agreed budgets were then prepared in suitable form for presentation to both the colliery manager and departmental heads. Budgets, actuals, and variances are on a cumulative basis throughout the week. The colliery manager's statement is not concerned with detail, but the statements for departments (Table 2) provide, in addition to total cumulative variances from budget, the actual details of the overtime.

Time clerks record all the actual information necessary by 9 a.m. each morning for the previous 24 hr. As they have to check shifts and overtime in the master register against deputies' timesheets, the only extra work involved is to enter actual overtime into the overtime record books for the various departments. The time involved is negligible and an additional advantage is that the timekeepers have to check time daily instead of leaving such work until later. The completed overtime record books for all departments are then sent to the colliery cost clerk for totalling, and summarizing into the manager's summary book.

The use of the system has been responsible for the overtime level being consistently maintained at below 7 per cent. Before the introduction the figures were in the region of 8 per cent. Maintenance of the system is easy and effective and the time taken by everybody concerned in its operation is very small. Finally, similar, and in some cases larger, savings have been made

at other collieries where the method has been used.

With the satisfactory completion of the system for overtime control, the time was ripe for a study of other control measures. The advent of 1959, with the change in the economic circumstances in the industry, made it essential that a review be made of the systems of materials control.

Materials Control

Previously, the system in operation at Brookhill Colliery for the control of materials, was by fixed daily budgets for materials in general use. The fixed daily budget was adjusted according to underground observations of under- or over-stocking. Control was also maintained by *ad hoc* investigations into the cause of unfavourable cost trends, and economies effected by reclamation and re-use of second-hand material.

One of the disadvantages of the system was that the budget was fixed, and no means was provided for the automatic adjustment of requirements according to output and advance. Visual indication of overstocking usually resulted in arbitrary adjustments. Nevertheless, as the results showed, it was reasonably effective.

Before determining any plan for a stricter control of materials, a comparison was made between the No. 4 Area and Brookhill Colliery material costs for the year 1958. Table 3 shows the result of this comparison.

TABLE 3.—*Comparison of Material Costs for 1958 between Brookhill Colliery and No. 4 Area, East Midlands Division.*

Material items.	No. 4 Area.		Brookhill Colliery.	
	Cost per ton.	Percentage cost.	Cost per ton.	Percentage cost.
	s. d.		s. d.	
Total face supports	2 7.2	22.4	1 6.5	16.6
Total road supports	2 7.8	22.8	3 0.7	33.0
Explosives	6.0		11.3	
Conveyor belt	1 4.3		10.2	
,, structure	6.8		1.3	
Electrical supplies	11.6		8.6	
Coal-face m/c and spares ..	1 0.2		9.8	
Other plant, equipment, and spares	7.2		2.9	
All other items	1 4.2		11.7	
Total other than face and roadways	6 4.3	54.8	4 7.8	50.4
Total colliery	11 7.3	100.0	9 3.0	100.0

An examination of Table 3 showed that the material costs at Brookhill compared favourably with Area results with one exception, that of roadway supports. At 3s. 0.7d./saleable ton, roadway supports accounted for approximately one-third of the total material costs.

Control of Roadway Supports

As arches, girders, and joists accounted for 2s. 9d. of this 3s. 0.7d. it was considered that a review of steel arches was a first essential. To this end it was decided to start with no established forms, and to effect a gradual build-up.

The present procedure for the control of arches was built up by:—

(1) Establishing the number of arches set each week by types, size, and the place set. This is completed by the senior undermanager on duty at the weekend.

(2) Establishing the underground stock positions at the end of each week. This is completed by the cost clerk on the basis of information passed from the undermanager and the materials overman, who confirms delivery, and any transfers of arches. Confirmation of these figures is obtained by comparison with a weekly physical stock count which is made by the steel checkers.

(3) Establishing requirements for current work on the basis of all the above information together with any special future circumstances. These decisions are taken by the manager, who then decides whether these requirements will be met from new supplies on the surface, reclaimed or reconditioned arches, or adjustments of underground stocks.

(4) Communicating the intention to all concerned.

The system for the control of arches has been in operation since February, 1959, and has proved to be satisfactory and effective, but it should be stressed that effective operation depends on continual activity in relation to the salvage plan in order to provide a constant supply of reclaimed materials. Responsibility for salvage and supply of information rests with the supports economy officer.

Control of Other Materials

Shortly after the introduction of the arches control system it was considered that the time was opportune to introduce weekly adjusted budgets for the main consumable items. The compilation of such budgets is simple, and is based on the previous week's district advances, and also the stock figures and returns from the districts. If the adjusted budgets are to be real then the information on which they are based must be accurate.

It is usual at Brookhill Colliery for the district advance, as entered by the underground officials, to be compiled by the cost clerk, who, at the same time, checks the information against the surveyor's weekly measurements. Apart from this a stock check is taken weekly on each district of all consumable materials in stock. These are completed by steel checkers, working under the direction of the supports economy officer. The results of the stock checks are entered on district forms, which are correlated and drawn up on a master form. The main use for these forms lies in the fact that it is not always true that the consumption of material is in direct proportion to the face advance.

In the adjusted budget sheets rigid steel props are included, since as many of these as possible are obtained from reclaimed steel arches which cannot be reconditioned. Such a system gives control of most of the main consumable items of materials. If any materials are required in addition to the quantities budgeted each week, then additional

requisitions must be made out on a daily basis by the materials officer.

For all practical purposes, control of materials is on a physical basis for levels of management below that of manager. A weekly cost sheet is prepared by the cost clerk for the benefit of the manager.

It might be thought that with the number of returns involved the amount of extra work involved is excessive. This is not so, indeed the approximate periods spent each week by the persons concerned are:—Manager, 1 hr.; undermanager, ½ hr.; cost clerk, 5 hr.; supports economy officer, 2 hr.; materials control officer, 4 hr.; and the five steel checkers, 4 hr. each.

The operation of the system has brought out the following advantages:—(1) Accurate current information is always available for the use and guidance of management; (2) requirements, ordering, issuing, transporting can all be planned well in advance and there is no need for panic ordering; (3) reclamation, reconditioning, and re-use of material is geared to the overall system, and takes its place alongside production activities; (4) control of the surface stock levels of new materials helps to keep at a minimum the capital tied up in surface stocks; (5) cost reduction results due to the correct facts being known, and departmental heads being called on to account for excessive usage; and (6) the full effects of organized reclamation, reconditioning, and re-use of materials are felt.

During the 11 months, to the end of November, 1959, 487,783 tons of saleable coal were produced, while the value of material issues amounted to £224,854, which is equivalent to a cost per ton saleable of 9s. 2.6d. However, during this period, £26,503 of revenue expenditure associated with the installation of trepanners was included in the cost of materials issues. This is equivalent to a cost of 1s. 1.0d.; the actual cost of normal issues during the period is 8s. 1.6d./saleable ton.

The cost of 8s. 1.6d. is directly comparable with the average cost for 1958, of 9s. 3.0d., since no new installations took place during that year. The improvement of 1s. 1.4d. on the average for 1958 is equivalent to a sterling value of £27,240.

Control of Piecework Earnings

The most significant element of colliery cost is the cost of wages, which amounts to approximately 50 per cent. of total costs, and one of the more important controls at Brookhill is the one devoted to piecework earnings. This, although not yet implemented on all contracts, was introduced for the first time in July, 1959. The system to be described aims to standardize the form of recording of piecework particulars by time clerks; provide a ready guidance to colliery management reviewing piecework particulars and earnings before authorizing payments; ensure that the intentions of a signed contract are applied; provide a record which will facilitate the work of internal auditing; place the emphasis on control before the event rather than after, and spotlight abnormal payments.

One form only (Table 4) for each contract is used, and is compiled weekly by the time clerks and cost clerk jointly. Time clerks record the details of work done, shifts worked, and calculate the gross earnings. The control basis guide already entered in the table enables the time clerks to query items with the deputies, and thereby save time when the wages are reviewed prior to payment being authorized by the undermanager and manager.

The partly completed form is then passed on to the cost clerk for calculation, and entry of o.m.s., e.m.s., and unit cost, both in actuals and expressed in each case as a percentage of the budgets. These entries are first of all entered in pencil, passed to the undermanager and manager for review. If no adjustments are made then the figures are entered in ink. Where adjustments are made the cost clerk

TABLE 4.—*Piecework Particulars and Wages Computation Schedule for South 3's Main-gate Rip, Brookhill Colliery.*

Control basis.	Contract items.	Budget details.			Actuals. Week ended Nov. 7.			Week ended Nov. 14.		
	Height	8½ ft.			8½ ft.			8½ ft.		
	Width	12½ ft.			12½ ft.			12½ ft.		
	Length of gate	5 ft./turnover			4,848 ft.			4,873 ft.		
		No.	Rate.	Earnings.	No.	Rate.	Earnings.	No.	Rate.	Earnings.
			s. d.	£ s. d.		s. d.	£ s. d.		s. d.	£ s. d.
5¾d. per cub. ft converted to rate per yd. advance	Ripping	1¾	152 4	12 13 11	6¼	152 4	48 4 9	8¼	152 4	63 9 5
1 per yd. advance	Arches	1½	11 10	19 8	6	11 10	3 11 0	8	11 10	4 14 8
1 per turnover	Cover belt	1	10 6	10 6	4	10 6	2 2 0	5	10 6	2 12 6
1 per turnover	Horse heads and lip supports	1	6 0	6 0	4	6 0	1 4 0	5	6 0	1 10 0
4 per turnover	Withdraw channels	4	6 0	1 4 0	16	6 0	4 16 0	20	6 0	6 0 0
1 per turnover	Material	1	18 6	18 6	4	18 6	3 14 0	5	18 6	4 12 6
1/10 per turnover	Ring tapping	1/10	37 0	3 8	½	37 0	18 6	½	37 0	18 6
	Timbering				1	18 6	18 6	1	18 6	18 6
	Extra packing				8	5 9	2 6 0	8	5 9	2 6 0
	Total contract earnings			£16 16s. 3d.			£67 14s. 9d.			£87 2s. 1d.
	Shifts worked ordinary			4			16			20
	Shifts worked overtime			—			8/15			—
	Shifts worked total			4			16 8/15			20
	E.m.s.			84s. 1d.			81s. 11d.			87s. 1d.
	O.m.s. (yd. adv. per manshift worked)			0.4167			0.3831			0.4167
	Unit cost (£ per yard advance)			10.0875			10.6954			10.4525
	Percentage of budgeted e.m.s.			100			97			104
	,, ,, o.m.s.			100			92			100
	,, ,, cost			100			106			104
	E.m.s. equivalent to actual o.m.s.			84s. 1d.			77s. 4d.			84s. 1d.

re-calculates the figures for final approval. From the use of these control sheets many benefits accrue.

Contracts can be more easily checked. The four salient figures to consider as a group are the percentage of budget, e.m.s., o.m.s., and cost. Where these approximate to 100 per cent. there can be very little wrong with the piecework particulars. Any difference will, of course, be reflected in the e.m.s. equivalent to the actual o.m.s. column. Such cases must, of course, be investigated.

Arithmetical errors are also quickly shown up, and can be put right before the gross pay-sheets are forwarded to group wages office. The time which would be taken by the cost clerk to complete as many as 50 contract forms is estimated to be no longer than 4 hr.

During the time that cost-control measures were being implemented, it was quickly realized that one of the requirements for effective control was to have the facts in an easily obtainable, and digestible form. For this reason a simple card index recording system was installed early in 1959, in which all the control information was recorded.

A card index cabinet is situated in the colliery manager's office and contains 16 trays. Each tray contains two sets of 50 cards. When the cabinet is closed the visual indicators on the front reveal the contents of the trays, making selection of a particular tray an easy matter.

When the appropriate tray is selected and pulled forward, every card heading within the trays is revealed. Individual cards in a tray are hinged so that they turn back and stay open, showing the required information.

All colliery control information is processed through the card index cabinet. Present colliery staff have been made responsible for the recording after instruction and training. Essential control information is extracted from details and recorded on the appropriate cards. Actuals are compared where necessary with the manager's intentions, and deviations are indicated by marking the cards with red visual indications. Any remedial action put in hand is also noted, while any deviation requiring explanation is queried with the department responsible. The detailed statistics are filed in the appropriate file, unless it is considered essential to pass them first to the manager.

Since the inception of this card index system, it has been found that there is always available a ready reference of broad control information cutting out a flow of books and forms from various departments to the colliery manager. An indicator system also reveals to the colliery manager any aspect of colliery operations where action is needed.

Conclusions

The National Coal Board has recently introduced a standard system of production and cost control for operation at all collieries. The basic principles set out in the national scheme, have, in fact, been used in evolving the control measures at Brookhill. Some adjustments may, however, be required to conform to national, divisional, or Area requirements.

Thanks are due to Mr. F. D. Severn, Area general manager, No. 4 Area, East Midlands Division, NCB, for permission to give this paper, Mr. C. Round, No. 4 Area production manager, for his helpful criticism, and Mr. A. Hancock, group cost development officer, without whom the controls could not have been effectively introduced.

DISCUSSION

MR. G. INVERARITY thought that the budget figures would not in themselves control overtime, and said he would like more information on what actual steps were taken to effect control. He wondered whether there was enough emphasis on the duties of the underground materials officer.

In reply, the AUTHOR said that budget figures alone could not control overtime, but they provided an overall framework within which a departmental head should operate. Ultimate control could only come if it was based on reliable up-to-date information, and this was provided to both departmental heads and the colliery manager. Adverse trends could be noted promptly and action taken by the departmental heads if necessary.

The duties of the underground materials officer were not fully illustrated in the paper. This official was responsible for ensuring that supplies arrived at their correct destination, and, in fact, adjusted the supplies budget on a weekly basis. He also ordered, on a daily basis, any supplies needed above the budget.

MR. R. E. WEBB asked if the author had yet evolved a satisfactory way of controlling smaller materials such as nuts and bolts, belt clips, and the like. Replying, the AUTHOR said these items were grouped together in the cost statement and shown as "All Other Issues," and at Brookhill amounted to approximately 11d./ton. Such issues were watched on the basis of cost trends, and no attempt had been made to go into great detail. It was a question of deciding whether the cost of extensive control of such items would be justified by the saving.

Replying to MR. C. ROUND, who asked how much his supports costs would have been had the reclamation programme not been carried out, the AUTHOR said that the reclamation programme was only part of the main salvage plan, but it was possible to assess the effects of this reclamation. In 1959, 1,825 arches were reclaimed, and 3,390 steel props were made, amounting to a sterling value of approximately £14,600. This was equivalent to 6½d./ton so that supports costs would have been increased by this sum.

MR. W. SHARPE asked questions on the weekly checking of underground stocks, the control of overtime of the underground mechanics and electricians, the authorization of overtime on coal faces if they were not filled off to time, and the weekly revision of materials budgets. He also asked if the author visualized any difficulty in fitting this scheme into the overall NCB control system. Replying, the AUTHOR said steel checkers compiled the underground stock sheets, and the unit engineer and the electrical engineer controlled the overtime of underground mechanics and electricians, respectively. The incidence of face overtime was very small at Brookhill, but, when necessary, was authorized by the undermanager. The materials budgets were revised weekly by the underground material officer in conjunction with the colliery cost clerk. No difficulty was expected in conforming to the NCB control

system, but adjustments would be required to conform with Area requirements.

MR. F. TURTON wondered if the author had actually costed the wages spent on salvage and reclamation, and asked if the underground materials officer examined finished underground roadways and made recommendations as to order of priority in salvage. In reply, the AUTHOR said that approximately 60 manshifts/week were expended on salvage and reclamation. While no actual detailed costing had been obtained, this represented approximately a yearly wage bill of £7,000. The reclamation of props and arches had saved £14,600 in a year, and in addition large quantities of conveyor belting, structure, and rails, etc., had been recovered. The saving was therefore considerable.

Referring to the second point, the underground materials officer, in conjunction with the undermanager and the supports economy officer, had a responsibility for the proper withdrawal of materials from disused districts.

MR. B. GASCOYNE asked if the saving of £27,000 was wholly attributable to the control system or if pit changes could be partly attributable. The AUTHOR said that it was as a result of action taken from the information provided; pit conditions might well have resulted in a cost increase.

Replying to MR. D. MARRIOTT, who thought that the reference to the "flexibility of the system" needed further clarification, the AUTHOR said the average number of ordinary shifts/week at Brookhill was 3,870, but the actual number was usually above or below this figure. If they were to work to a figure of 7 per cent. overtime, then the number of allowable overtime shifts could vary. Such a system as had been outlined could adjust itself to cater for this. In addition, as work loads in the various departments were always changing, it was important, if necessary, to transfer overtime shifts from one department to another. This the manager could do, since he was in possession of all the facts.

In reply to a question by MR. A. VARDY, the AUTHOR said the siting of the control cabinet in the manager's office was considered satisfactory, as it was accessible to all the persons concerned.

MR. W. SHARPE said that sometimes in double-shift pits, in order not to denude coal faces too far, some positions had to be staffed by men working overtime, and he asked, how, in such circumstances, control was kept effective. He also wanted to know if overtime was recorded by a deputy, time clerk, or by a time clock. In answer, the AUTHOR said it was accepted that such a situation could arise, but effective control was still effective since the facts were known. It might well be that in certain exceptional circumstances the 7 per cent. figure for overtime could not be maintained. The deputy entered overtime for underground work, but this was checked by the time clerks against the master register.

Mechanized Foundry for Mining Equipment Manufacturers

A NEW foundry put down at Penygroes (Caernarvonshire) to produce mining machinery has helped to reduce unemployment in North Wales.

POURING METAL FROM THE BIRLEFCO ELECTRIC FURNACES TO FORM A STARTING-UP PLUG FOR THE FOLLOWING DAY.

Austin Hopkinson & Company, Limited, Audenshaw, manufacturers of Pikrose mining equipment, was encouraged by the Development Commission to site the new foundry at Penygroes, since the village, for long dependent upon slate quarrying for its prosperity, had suffered the effects of acute unemployment when many of the quarries were forced to close. The debt owed to the past is acknowledged in the external appearance of the factory. The lower part of the front wall, which faces roughly northwards at right angles to the main road (A4085), and one wall of the entrance hall were built in a green slate from a nearby quarry. These walls, with their rough-hewn texture of greens, browns, reds, and yellows, are a handsome feature of the factory's architectural design.

In the factory building three working bays are provided: one is for mould making and cores, one for mould assembly and casting, and the third is a machine shop. A part of the works is equipped as a fabrication section, where welded fabrications and steelwork are constructed. The bays are each 250 ft. long and 35 ft. wide, and measure 20 ft. to the underside of the roof trusses. The building, which adjoins the office block, is of steel-frame construction. Overhead travelling cranes of 3 tons capacity are provided in each of the three bays.

Two Birlefco mains frequency coreless induction melting furnaces are installed in the casting bay, which produces iron castings up to 1 ton and steel castings up to 10 cwt. by the CO_2 process. The Nomad pallet conveyor system (Hepburn Conveyor Company, Limited, Wakefield) was adopted for handling the patterns and moulding boxes.

Oxygen Refining of Iron:

Recovery of Unburnt Gases

By MARC ALLARD* and GERALD NAMY†

This is a translation of a paper by Allard and Namy in the March, 1960, issue of Revue de Metallurgie. It describes a development for the oxygen converter processes which will still further strengthen their position. Trials by IRSID and CAFL have demonstrated two practical devices for collecting the unburnt gases at the top of a converter. Both methods enable the thermal potential of the gases to be utilized and the size of the gas-cleaning plant to be substantially reduced because the volume of gas to be cleaned is less.

THE struggle against atmospheric pollution becomes more severe as the refining of liquid iron with pure oxygen discharges into the air growing volumes of fume, coloured brown or red by the fine dust which they contain. In the processes which use a rotary furnace (KALDO, ROTOR), it is in the furnace itself that a major part of the CO is produced is burnt up by the pure oxygen, and the rotary action allows of the rise in temperature of the lining being kept in check and of a large part of the liberated calories being transmitted to the bath. Only the CO which is not burnt in this way is changed into CO_2 in the smoke collecting hood, and the total volume of this smoke is thus limited.

In the processes using fixed equipment of the LD type, the problem is more difficult, for the gases inside the furnace are made up essentially of CO, about 90 per cent., as shown in Fig. 1, which gives the results recorded at Denain by IRSID on a 30-ton plant using the OLP process. Burnt in the hood, with a great excess of air, these gases give off an enormous amount of smoke, which it is then necessary to cool down and clean. Satisfactory cleaning installations are available but their size, and, consequently, their cost of installation and running, are considerable, because the volume of fume to be treated in them is very great.

Hence, it was quite natural to think of direct recovery of the CO produced, that is, without burning in air, which could, moreover, be used in the works, after cleaning, as a gas of high calorific value. Mention of this idea can be found in technical literature[1, 2], and IRSID, led into this direction by its own studies of refining with pure oxygen, had conceived a fairly simple process of recovery. At the same time, Namy, chief engineer with CAFL, was asking IRSID also to make tests with a recovery process which he had evolved. He was proposing the erection, at the expense of his company, of a plant on the 6-ton pure oxygen converter at the pilot plant at Maizières.

By combining their efforts, CAFL and IRSID have been able, thanks particularly to the energy of M. Namy and to the financial support given by his company, to carry out quickly at the pilot plant at Maizières-les-Metz, series of tests on the recovery of unburnt gases, in a hood allowing for both of their methods being applied. (Patent applications have been made by IRSID and CAFL on this subject).

The conditions under which these tests have been carried out are described below, with descriptions of the CAFL process, and of the IRSID process, followed by heat balances, remarks on dust removal, and conclusions drawn from them.—M. MARC ALLARD.

CONDITIONS OF THE PILOT PLANT TESTS

Before going into details about the recovery of the gases and the cleaning of them, it is useful to consider the facilities provided in the melting shop of the new IRSID pilot plant. This melting shop[3] includes a 5- to 6-ton converter, fed with molten iron from an electric furnace of the same capacity. For refining by means of a vertical lance from the

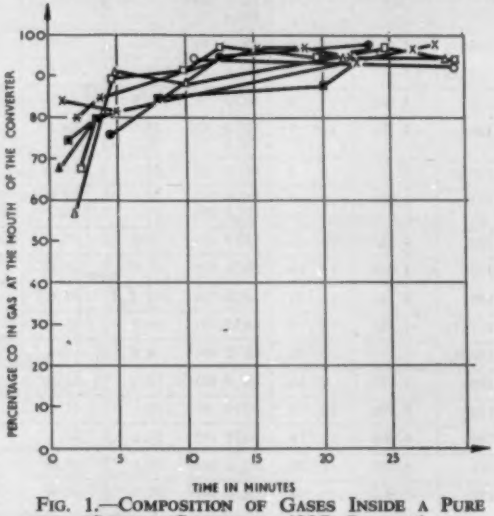


FIG. 1.—COMPOSITION OF GASES INSIDE A PURE OXYGEN CONVERTER (OLP PROCESS).

* Institut de Recherches de la Sidérurgie (IRSID).
† La Compagnie des Ateliers and Forges de la Loire (CAFL).

top, this converter is provided with a solid base and a casting hole. A gibbet supports the water-cooled lance, with its various wires, while two powder distributors and an assembly of measuring apparatus allow of precise control of the oxygen supply and of the lime concentrations for working to the OLP process[4]. Refining with oxygen alone is, naturally, also possible.

The cooling additions necessary for heat control during refining have, during these tests, been essentially composed of rich iron ores, introduced in powder form with the lime into the oxygen jet or in the form of small lumps (10 to 20 mm.) (0.4 to 0.8 in.) by means of a small spout provided for this purpose.

Gas recovery processes must obviously not be tied to a given composition of iron and thus variations have been made deliberately in the original analysis within wide limits, ranging from hematite irons with 0.1 to 1.7 per cent. Si to Thomas-type iron with 1.8 per cent. P. The lime concentration in the oxygen jet as well as the cooling additions have been adapted to suit the analysis of the iron and to the refining phase.

As the purpose of the tests was essentially the technique of gas recovery and not a metallurgical

TABLE 1.

Cast No.	Weight of iron, tons (metric).	Blowing time, min. sec.	Oxygen supply, Nm^3/min. min. sec.	Total oxygen consumed* Nm^3/t.	Lime consumption, Kg/t.	Initial iron analysis.				Final metal analysis.		
						Temperature, deg. C.	C, per cent.	Si, per cent.	P, per cent.	Temperature, deg. C.	C, per cent.	P, per cent.
90	5.070	10 0	10(5 0) 14(2 0) 10(3 0)	23.0	21.8	1,445	3.76	0.34		1,600	2.36	
91	4.780	11 40	10(6 0) 12(4 0) 15(1 40)	29.3	18.0	1,370	4.10	0.42		1,570	2.25	
93	5.080	4 4	15(4 4)	14.8	9.1	1,390	4.07	0.42		1,530	3.32	
95	5.220	10 10	10(1 30) 12(2 10) 15(6 30)	28.1	20.5		3.62	0.43			1.92	
97 (1)	4.000	10 0	10(2 0) 12(3 0) 15(5 0)	34.5	21.8	1,290	4.07	0.54		1,580	1.61	
97 (2)		5 0	12(2 30) 15(2 30)	17.5	9.1	1,580	1.61			1,600	0.20	
111	4.660	12 50	10(4 0) 12(2 0) 15(2 0) 12(4 50)	35.2	27.1	1,280	3.85	0.70		1,550	1.64	0.060
113	4.520	5 0	12(5 0)	13.8	7.9	1,320	3.60	0.55	0.065	1,480	3.05	0.045
114	5.100	9 30	10(1 30) 12(5 30) 10(2 30)	22.2	16.6	1,370	3.20	0.63	0.120	1,610	1.85	0.060
116 (1)	4.940	9 0	15(9 0)	28.2	10.1	1,380	4.05	0.45	0.130	1,635	1.80	0.067
116 (2)		5 40	15(5 40)	18.3	10.8	1,635	1.80		0.067	1,635	0.080	0.039
118	4.900	11 0	15(11 0)	37.1	44.5	1,335	3.77	1.37	0.069	1,615	1.15	0.025
120 (1)	4.890	12 0	15(9 0) 12(3 0)	40.0	59.5	1,355	4.20	1.66	0.070	1,650	1.50	0.080
120 (2)		5 0	15(5 0)	26.5	15.0	1,650	1.50		0.080	1,650	0.030	0.015
121	4.850	17 10	15(9 50) 12(7 20)	57.0	92.0	1,270	3.85	0.40	1.70	1,630	0.57	0.23
122	5.240	16 45	15(16 45)	51.0	82.0	1,270	3.95	0.45	1.68	1,650	0.61	0.70
123	4.990	12 20	13(12 20)	32.2	141.6	1,430	3.75	0.37	1.80	1,485	2.35	0.10
126	4.780	13 20	15(13 20)	43.3	64.0	1,290	3.90	1.31	0.48	1,660	1.03	0.19
127 (1)	4.530	12 0	15(12 0)	44.5	65.0	1,325	3.75	1.34	0.18	1,670	0.73	0.13
127 (2)		2 35	15(2 35)	9.6	5.5	1,670	0.73		0.13	1,645	0.047	0.034
128	5.110	6 45	15(6 45)	19.8	61.0	1,450	3.43	1.24	0.60	1,630	2.50	0.44
129	4.570	10 0	10(10 0)	22.0	31.0	1,290	3.75	0.66	0.47	1,630	2.60	0.31
130	4.860	11 15	10(11 15)	24.5	53.1	1,345	3.57	0.1	0.50	1,520	1.80	0.069
131	4.570	7 30	15(7 30)	24.6	23.0	1,330	3.82	0.64	0.13	1,590	2.12	0.11
132	5.010	8 30	18(8 30)	31.5	36.8	1,350	4.22	0.34	0.11	1,565	1.52	0.037

* Including oxygen from ore.

study of refining, the experiments have been directed to more or less extensive refining, with or without removal of intermediate slag, some being stopped with the carbon content still remaining high, and others continued to dead soft steel. In addition, one charge was reserved for a special treatment of Thomas iron involving dephosphorization with limited decarburization.

Table 1 shows the main data collected from the 21 trial casts. For these charges, of the order of 5 tons of cast iron, the consumption of gaseous oxygen was between 10 and 18 Nm^3/min. (350 to 635 cub. ft./min.) This supply, which gave refining times well adapted to the scale in question, is obviously far from those of 100 Nm^3/min. (3,530 cub. ft./min.), or over, used with large existing converters, and, consequently, the phenomena of jet impact and bath agitation can present quite a different aspect in the two cases. But, even on the 5-ton scale, following the refining phase and the controls adopted, metal or slag are capable of being projected from the nose of the converter to strike against the walls of the hood cooled with water. The test of desphosphorization with limited decarburization, carried out with the lance deliberately kept high up, had for its object the study of the behaviour of the installation in the event of extensive foaming of the slag.

As the speed of decarburization is an essential factor in every process for recovery of converter gases, curves of carbon evolution relating to hematite irons are given in Fig. 2. These graphs show that, for carbon contents above 0.8 per cent., the speed of decarburization is practically constant, excluding the initial period covering the removal of the silicon, which is more or less prolonged according to the content of this element. It is only

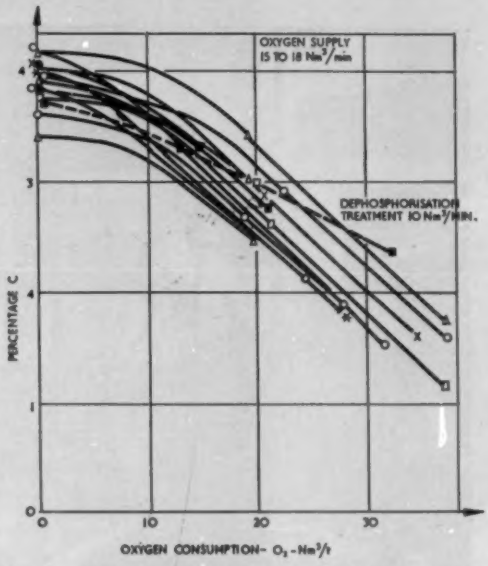
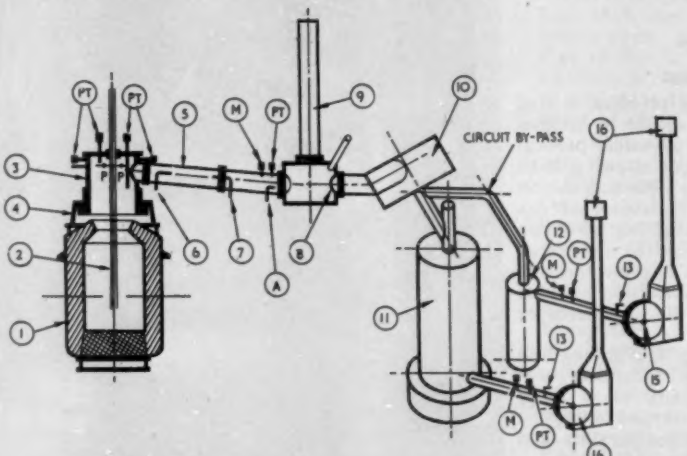


FIG. 2.—SPEED OF DECARBURIZATION OF IRON DURING TESTS RELATED TO OXYGEN CONSUMPTION.

subsequent to the carbon content reaching about 0.8 per cent. that the decarburization curve inflects as a result of the formation of an increasing amount of iron oxide in the slag.

The ore additions must also be taken into account, as they bring oxygen which reacts on the carbon more or less quickly in accordance with the size



1.—Converter. 2.—Oxygen lance. 3.—Recovery hood in water jacket. 4.—Movable sleeve. 5.—Gas outlet tube. 6.—Steam injector. 7.—Steam injector (against the current). 8.—Valve clack. 9.—Director draught chimney. 10.—Washing chamber. 11.—Solivore dust remover. 12.—Water trap. 13.—Control throttle. 14.—Exhaust fan for dust-freed gas. 15.—Exhaust fan for partly dust-freed gas. 16.—Flares. P.—Pressure reading for hood. PT.—Temperature reading. A.—Gas sample for analysis. M.—Removal of dust.

FIG. 3.—GENERAL LAYOUT OF PLANT.

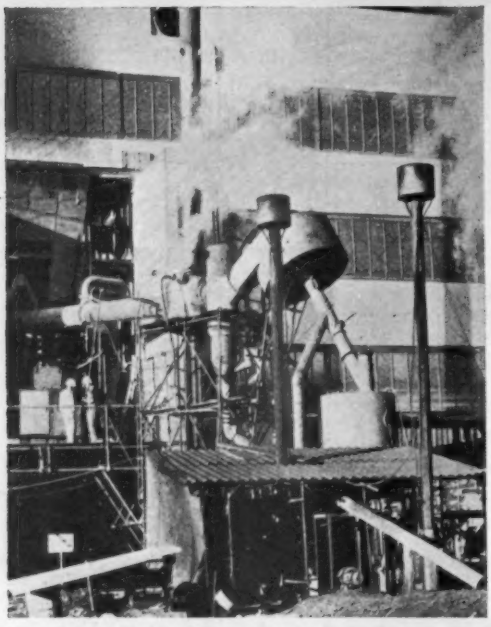


FIG. 4.—GENERAL VIEW OF PLANT.

of the ore, the physical state of the slag, and the temperature and composition of the bath. Moreover, certain ores cause a sudden release of steam, causing a fierce rise in the hydrogen content of the gases, as will be seen later.

CAFL PROCESS

Description of Plant

After a theoretical study of the problem, it was decided that the following points should be verified experimentally:—Recovery, with all safety precautions, of the gas produced, without allowing it to burn in the nose; richness of gas obtained during the various phases of blowing; behaviour of gas during dust removal, as well as efficiency of device used. The objective was thus limited to a series of experiments and it was with these in mind that the pilot plant was designed. After conclusion of these tests a few runs were made on the same lines as for industrial working.

Fig. 3 gives a diagram and Fig. 4 a photograph of the plant. This installation comprises:—A catchment hood (Fig. 5) consisting of a water jacket, through which passes the oxygen lance; the hopper for ore additions; various temperature and pressure inlets, etc.

Air-tightness between catchment hood and converter nose is ensured by means of a patented device, comprising:—A movable sleeve cooled by steam from an outside source and resting freely on a seating fixed to the converter shell (an injection of steam between the sleeve and its seating improves the air-tightness of the joint); a gas outlet tube, water cooled over part of its length, leading to a blow-off chimney (Fig. 6) (this primary circuit, controlled by a steam injector placed on the axis of the tube, allows the pressure in the catchment hood to be regulated); a water-circulating clack valve, with steam injections in each of its two postitions so as to avoid entry of air (this clapper ensures evacuation of the gases, either towards the blow-off chimney or to the gas-cleaning circuit, making it possible to change from one position to the other during the course of refining and with practically no sudden stoppage in the flow of gas); a primary cleaning circuit consisting of a washing tower of small size in which the gases pass through a number of water baffles; two separate circuits enabling gas cleaning to be studied in varying degrees (one of these takes the gases when they leave the cleaning tower and, by means of an extractor fan, discharges them into the air where they are burnt by a torch (Fig. 7), while the other passes the gases through a gas-cleaning plant fitted with venturis and a mechanical water atomizer; on leaving the gas-cleaning plant, the gases are driven by an extractor fan to a second torch where they burn in the open air (Fig. 7)). Two control throttle-valves, placed on each of the circuits, allow of manual maintenance in the hood

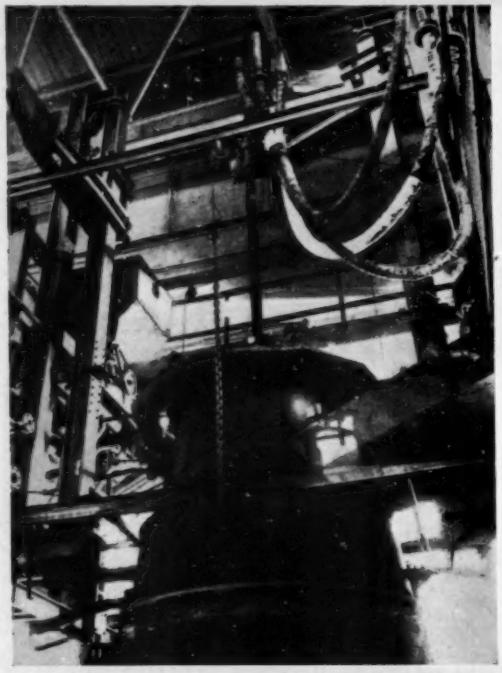


FIG. 5.—VIEW OF RECOVERY HOOD.

of a slight negative pressure when the full circuit is in use.

Description of Tests

A first series of tests, limited to partial refining, was carried out with the draught regulated by means of the steam injector and with the unburnt gases, not cleaned of dust, discharged from the top of the blow-off chimney (Fig. 7). This allowed of a study to be made of the safety measures required and of the composition of the dust and of the gas to be treated. It was only later that the whole of the plant was used for studying its behaviour and its efficiency during the course of the various phases of refining, it being possible to go as far as to dead soft steel.

The ejections of slag and metal during refining did not stick to the cooled wall, but fell back into the converter. The nose of the converter itself remained clean and there were no special difficulties during tipping in spite of the small clearance there was between the base of the hood and the nose. Some small splashings of slag were also collected in the gas discharge pipes, but it should be noted that, in this plant, the height of the hood was too small, as it was limited by the rails of the overhead crane belonging to the steel pilot plant.

FIG. 6.—VIEW OF BLOW-OFF CHIMNEY: GAS UNBURNT AND NOT CLEANED.

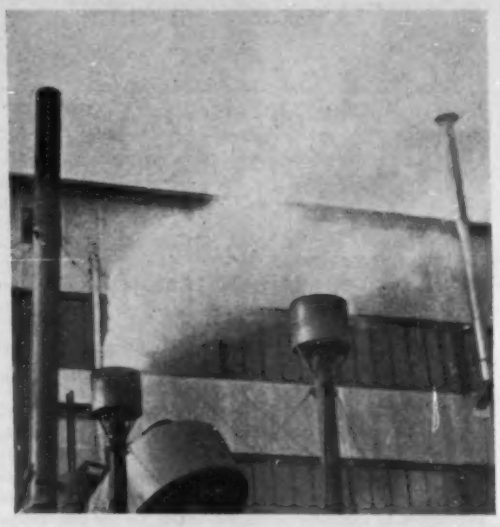


FIG. 7.—VIEW OF THE TWO FLARES AT OUTLET FROM GAS-CLEANING PLANT.

During these tests, and particularly during that of dephosphorization of Thomas iron with limited decarburization, extensive foaming was observed. The slag overflowed from the converter and mounted up into the hood. However, this slag, when solidified, is very friable and did not seem to hamper either the release of the loose sleeve nor the tipping of the converter.

The first runs were made with the tapping hole kept shut, but subsequently it was preferred to keep it open. Actually, this opening had the advantage in that it gave a fairly accurate idea of the agitation of the bath and gave warning in the case of abundant foaming. It could be observed that entry of air as a result of this was negligible and had practically no effect on the composition of the gas.

Figs. 8 and 9 give the analyses for CO, CO_2, O_2, H_2, and N_2 for casts 126 and 116, the first being stopped at a carbon content of 1 per cent. and the other continued to the stage of dead soft steel. It will be noticed that there is a fairly wide scatter of CO contents, which excluding the initial period of 3 min., generally varies between 50 and 75 per cent. This scatter is the result of admission of air due to:—Lack of air-tightness of certain joints of the pilot plant; the nature of the control of low pressure inside the hood. Fig. 10, in particular, shows clearly the influence of irregularities in this low pressure on admissions of nitrogen. Considerable improvements would be made in these two points for an industrial plant. Moreover, with converters of larger size, the increase in the ratio between gas discharge and extent of leakages of itself leads to a reduction in the percentage of air drawn in.

TABLE 2.—*Gas Analysis of Cast No. 120.*

Blowing time in min.	CO	CO_2	N_2	H_2	O_2
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	34.8	34.1	27.2	3.0	0.9
2	52.4	30.3	12.5	4.4	0.4
3	64.0	21.6	9.6	4.4	0.4
4	63.3	19.5	12.3	4.2	0.7
5	67.7	16.8	10.8	4.3	0.4
6	74.6	11.4	8.8	4.2	1.0
7	73.4	13.8	7.8	4.8	0.2
8	74.8	13.8	6.3	4.7	0.4
9	73.6	15.3	6.1	4.7	0.3
10	74.2	15.0	5.6	4.8	0.4
11	75.0	14.6	4.7	5.3	0.4
12	77.8	12.4	3.8	5.4	0.6
13	71.7	10.5	11.4	6.0	0.4
14	67.8	11.8	9.2	11.2	0
15	71.8	11.8	5.4	10.5	0.5
16	66.6	14.0	10.2	9.0	0.2
17	51.4	17.0	27.4	4.0	0.2

The best analyses have been obtained with a pressure in the hood in the region of zero. Thus, for cast No. 120, continued to the dead soft steel stage (C = 0.03 per cent. in converter), the gas analyses of which are to be found in Table 2, the average CO content is of the order of 70 per cent., with a maximum of 78 per cent. The hydrogen content in the trapped gases is normally limited to about 4 per cent., part of which must come from moisture in the lime. However, certain ores can modify this content, owing to the dissociation of the water they contain, and, in these tests, peaks of 18 per cent. hydrogen have been noted. On the other hand, it was found that the steam injection made at the nose of the the converter, and, a fortiori, in the gas circuit at lower temperatures, had practically no effect on the hydrogen content. The usual hydrogen content is definitely of the order of that found in producer gas.

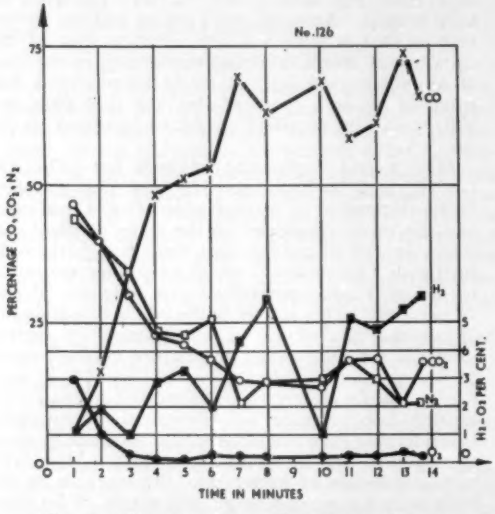


FIG. 8.—COMPOSITION OF RECOVERED GASES: CAST NO. 126 (CAFL PROCESS).

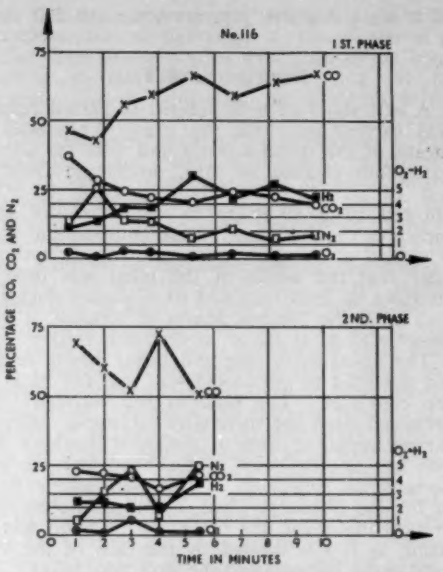


FIG. 9.—COMPOSITION OF RECOVERED GASES: CAST NO. 116 (CAFL PROCESS).

Gas Flow and Operational Controls

The volumes of gas recovered were measured on both circuits, and, as an example, Fig. 11 shows the total $CO+CO_2$ discharged for four hematite ore burdens and one phosphorous ore burden. In order to compare these discharge curves, it is necessary to bear in mind the blow characteristics and also the composition of the irons, in particular for Si and P (Table 1).

The measurement of the maximum gas flow and its relation to the average flow are important points as these affect the size of the plant for recovering and cleaning and also fix the range of control. It should be mentioned that this ratio is affected by ore additions. For the five casts shown in Fig. 11, this ratio is as follows:—

Cast No.	*Ratio maximum flow / mean flow*
114	1.33
116	1.4
121	1.26
126	1.55
127	1.66

The curve of total gas flow shows that the flow characteristic (taken with the analysis of the gas in CO/CO_2) defines fairly well the final condition of the cast for working mild steel. Thus, the two casts, 116 and 127, having, respectively, 0.08 and 0.05 per cent. C., have been stopped when the flow of gas was judged to be small enough. The

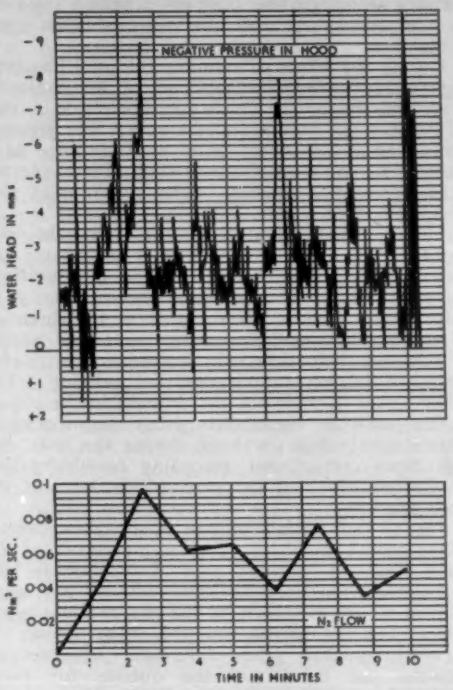


FIG. 10.—INFLUENCE OF DRAUGHT REGULATION ON COMPOSITION OF RECOVERED GASES (CAFL PROCESS).

size of the flame which was burning at the torch confirmed the indication given by the flowmeter.

In industrial operation it would be necessary to study closely the appearance of the gas flow curves as a function of the analysis of the bath; it is feasible that, at least for low carbon steels, the gas flow will be able to give a sufficiently precise idea of the end of the working.

The lack of luminosity of the flame at the converter nose made it impossible to use the viewers which were fitted, but the fact of no longer being able to see the flame should not hamper the operator. The flow curves, taken along with the indications of CO and CO_2 in the gases, will bring to the steelmaker definite information, which it is believed will enable him to carry out operations with security.

Special safety meaures were taken during the first series of tests, particularly by making extensive blow-offs with steam before and after each blow. Experience has shown that, in spite of a fairly tortuous gas circuit, these measures could be cut out. It is indeed sufficient to make sure that the oxygen cannot be blown in unless the extractor-fan is running and to finish off the operation by purging with air for a few minutes.

It may be noted that the feeding of clean gas on to a circuit in use can only be done by employing a device which guarantees a minimum CO content.

IRSID PROCESS

The principle of the IRSID process for collection of unburnt gases consists in using a hood placed at a certain distance above the converter nose, without any material connection between this hood and the converter, and maintaining a practically nil difference in pressure between the inside and the outside of the hood at its base. Under these conditions, in spite of the absence of joining materials, the almost nil difference in pressure prevents both inlets of air and large escapes, as the diagram in Fig. 12 shows, in principle. A kind of stationary condition is created for the recovered gases, of which the limited contact with the atmospheric air only causes eddies close to the surface of separation and fluctuations of pressure difference around the desired nil value.

This possibility of obtaining a stationary condition in a hood was, moreover, visualized in earlier tests on reduced-scale models in which the converter gases were represented by a mixture of CO_2 and titanium tetrachloride.

In order to maintain the desired pressure at the bottom of the hood, whatever may be the refining conditions and the phase of working, the draught of the whole system (hood-gas

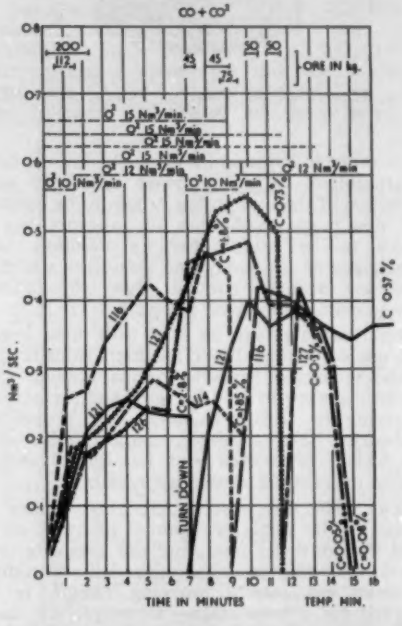


FIG. 11.—TOTAL CO + CO_2 EVOLUTION DURING REFINING OF CASTS 114, 116, 121, 126, AND 127 (CAFL PROCESS).

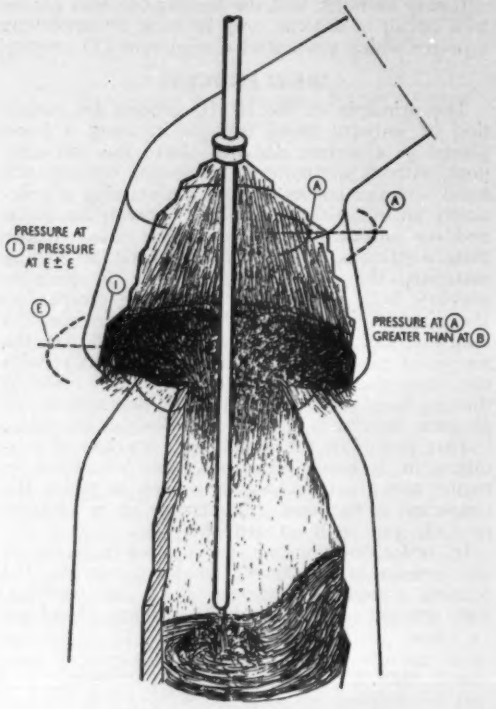


FIG. 12.—DIAGRAM SHOWING PRINCIPLE OF IRSID PROCESS.

evacuation) is adjusted by means of known devices. Measurement of the pressure difference enables the whole of the draughting system to be controlled. For this purpose, the use of injectors has been shown to be useful, for, in addition to the advantages of simplicity and flexibility which they have for draught control, they also allow of simultaneous cooling of the gases.

Different gases can be used with these injectors. The use of steam allows the high calorific power of the recovered gases to be maintained. Steam can be replaced by another gas, and, in particular, according to IRSID technique, by a gas which steelworks have available, namely, blast-furnace gas, which, when used cold, has the advantage of raising its calorific power appreciably.

Tests with this process have up to now been limited to the single problem of recovery of gases from the converter nose, and the complete investigation, including gas cleaning and the introduction of clean gas into a working circuit, is being reserved for a later stage. Consequently, use has been made of the following parts of the plant previously described (Figs. 3, 4, and 5):—The hood, with its sleeve held fixed in its upper position thus leaving the joint open; the horizontal tube for gas discharge; the blow-off chimney releasing to the atmosphere the unburnt dust-laden gases (Fig. 6).

During the whole of refining, the joint has been kept open between the top part of the converter nose and the hood, which corresponds to a ring 35 cm. (14 in.) wide round the nose. The pressure measuring point in the hood at a distance of 1 metre (39.4 in.) from the base (Fig. 3) is connected to a differential pressure indicator of great precision ($\frac{1}{10}$th of a mm. (0.004 in.) of water).

Under experimental conditions, draught was regulated by two steam injectors placed on the axis of the gas discharge tube, in the positions shown in Fig. 3, these two injectors being in opposition. One of them, fitted in the direction of the gas flow and previously mentioned above, is adjusted beforehand in accordance with the range of oxygen supply used for refining. The other serves to maintain the draught in the circuit to the suitable value throughout the operation. This control, done by hand during the tests, has also been carried out according to observation of the behaviour of the gases at the level of the open joint.

Fig. 13 shows the evolution of the phenomenon. While only a small leak due to unevenness of the hood creates a localized area of combustion, the gases inside the hood are held without any large inlet of air, as is shown by the gas analyses given later. Fig. 14 shows, on the other hand, the curves regulating the difference in pressure between the hood and the outside for three casts with oxygen supply of 10, 15, and 18 Nm^3/min. (350, 525, and 635 cub. ft./min.) The position of the pressure points at a level situated 1 metre (39.4 in.) above the base of the hood, where the differential pressure is regulated to a nil value, and also the variations in speed and temperature of the gases between these two levels, explain the positive value of this difference in pressure registered by the instruments. Under the conditions of these tests, this value is from 1 to 2 mm. of water (0.04 to 0.08 in.).

FIG. 13.—RECOVERY OF GASES AT CONVERTER MOUTH (IRSID PROCESS).

Figs. 15 and 16 show, as a function of length of blow, the contents of CO, CO_2, N_2, H_2, and O_2 for two partial refinings (Nos. 131 and 132 in Table 1).

Setting aside the initial period of 2 to 3 min. necessary for flushing out the converter and the circuits, it is seen that:— The gas has a high and regular CO content—60 to 80 per cent.; the H_2 content, below 2 per cent., remains very low throughout the length of the blow (it should be noted that no ore addition was made during the course of these casts); the O_2 content is also very low, less than 1 per cent.; the N_2 content allows the amount of air infiltration to be ascertained and calculations made on the casts mentioned provide Fig. 17, representing, as a function of the length of time of blowing, the volume of air which has entered the hood in proportion to the volume of gas produced in the converter. This air infiltration remains within the limits of 0.4 and 0.1 times the gas volumes. Fig. 17 also shows the order of magnitude of air infiltration for standard recovery hoods with combusion of CO, fitted or not with recuperation boiler. The CO_2 content is chiefly influenced by the air infiltration, but also by the yield of the oxygen jet, which, not being equal to 100 per cent., leads to the formation of a certain percentage of CO_2 in the inside of the converter itself. (Of the order of 10 per cent. according to Fig. 1.)

In the case of these tests it was not possible to measure the volumes of gas recovered and

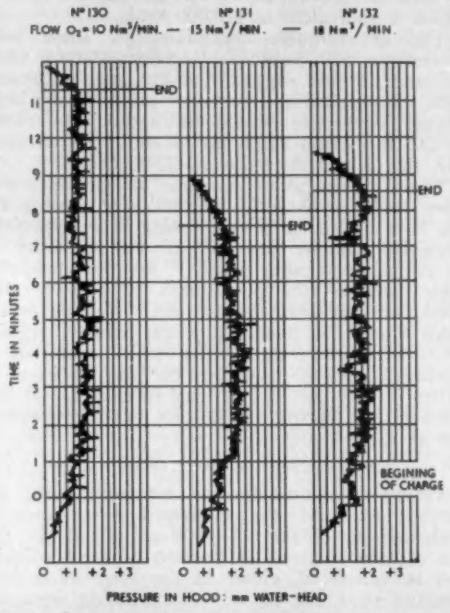


FIG. 14.—RECORD OF PRESSURE DIFFERENTIAL BETWEEN HOOD AND OUTSIDE (IRSID PROCESS).

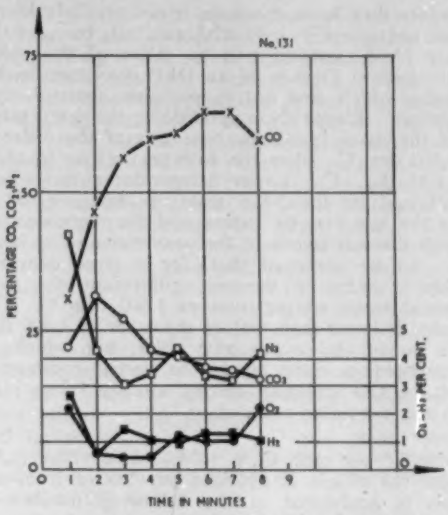


FIG. 15.—COMPOSITION OF RECOVERED GASES: CAST NO. 131 (IRSID PROCESS).

so it was not possible to know the loss due to the slight leak mentioned above.

HEAT BALANCE OF PROCESSES

It has been seen that, apart from the first few minutes of refining, the gases inside a pure oxygen converter are mainly composed of CO, and the curves in Fig. 1 show that this can amount to 90 per cent. CO and 10 per cent. CO_2.

The average temperature of these gases, just

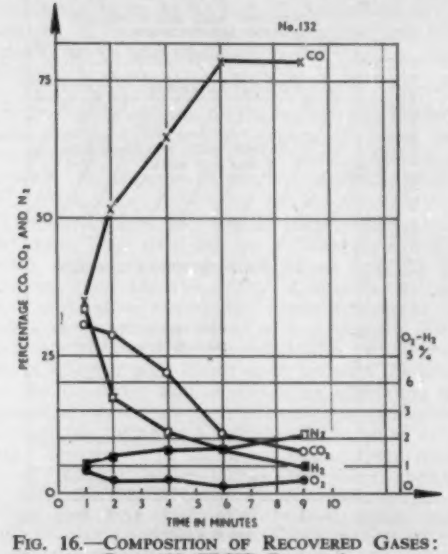


FIG. 16.—COMPOSITION OF RECOVERED GASES: CAST 132 (IRSID PROCESS).

before they leave the nose, is not precisely known for converters in industrial use, but, before fixing our ideas, account will be taken of the values obtained at Denain on an OLP converter, with a lining which was not in complete thermal equilibrium. Under these conditions, the temperature of the gases inside the nose was of the order of 1,500 deg. C., when the bath was set up to about 1,600 deg. C. Lower temperatures have been obtained on the 5-ton scale at Maizières, owing to the low rate of testing and the comparatively high thermal inertia of the converter and its hood. It can be reckoned that, for a large converter with a lining in thermal equilibrium, the gases would reach temperatures of 1.600 deg. C. This value is lower than that of the order of 1,800 deg. C. quoted by many authorities, but which, in our opinion, must be due to partial combustion of the CO and CO_2 having already taken place in the converter nose.

A simple calculation shows that, for an iron with 3.6 per cent. C., a volume of 67 Nm^3 (2,350 cub. ft.) of gas is obtained per ton of iron, and this is equivalent to the following number of calories:—

Latent heat of CO	181,000 kcal.
Specific heat of CO	34,000 kcal.
Specific heat of CO_2	6,000 kcal.
	221,000 kcal.

that is, an enthalpy of gas per ton of refined iron of 220,000 kcals., approximately.

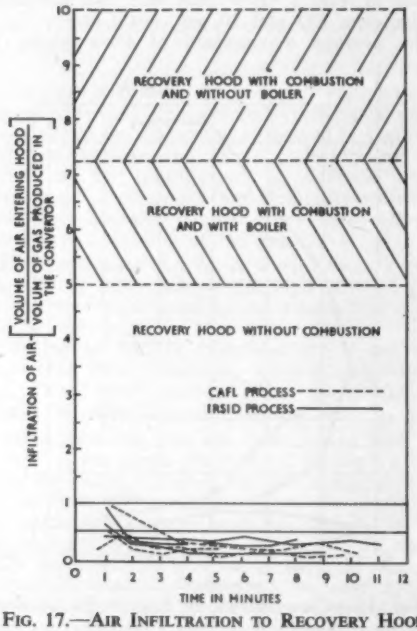

RECOVERY HOOD WITH COMBUSTION AND WITHOUT BOILER
RECOVERY HOOD WITH COMBUSTION AND WITH BOILER
RECOVERY HOOD WITHOUT COMBUSTION
CAFL PROCESS
IRSID PROCESS
VOLUME OF AIR ENTERING HOOD
VOLUM OF GAS PRODUCED IN THE CONVERTOR
INFILTRATION OF AIR
TIME IN MINUTES

FIG. 17.—AIR INFILTRATION TO RECOVERY HOOD.

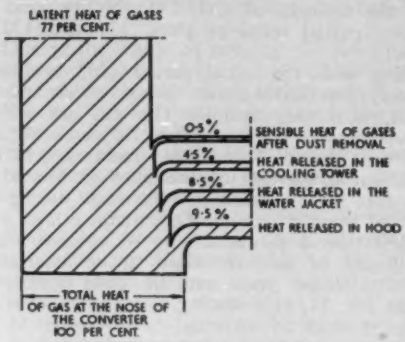

LATENT HEAT OF GASES 77 PER CENT.
0·5%
SENSIBLE HEAT OF GASES AFTER DUST REMOVAL
4·5%
HEAT RELEASED IN THE COOLING TOWER
8·5%
HEAT RELEASED IN THE WATER JACKET
9·5%
HEAT RELEASED IN HOOD
TOTAL HEAT OF GAS AT THE NOSE OF THE CONVERTER 100 PER CENT.

FIG. 18.—THERMAL BALANCE OF RECOVERY OF UNBURNT GASES.

Calorific Power of Recovered Gas

From the analyses of gas obtained by the two methods of recovery described above, the CO content can be taken as of the value of 70 per cent., whence a total of $CO+CO_2=86$ per cent., to which is to be added 2 per cent. of hydrogen. This gives a gas with a calorific value of 2,200 kcal./Nm^3, that is to say, an excellent fuel very comparable with the mixed gas generally used (one-third coke-oven gas and two-thirds blast-furnace gas). There is for disposal a volume of 78 Nm^3 (2,730 cub. ft.) of this gas per ton of iron, which is equivalent to 170,000 kcals.

The unfavourable conditions for these tests, carried out with improvized equipment on a small converter, would suggest that the gases recovered with an industrial recovery plant from large oxygen converters would be appreciably richer in CO and could reach up to about 80 per cent. CO, say, a calorific value of 2,500 kcals.

These results allow the use of the recovered gases to be envisaged. In particular, storing the gas in a gasometer after cleaning is an especially attractive solution in view of the regularity of its composition and supply. Mention has also been made of the possibilities of adding other gases, such as blast-furnace gas. By this means there would be available a gas with a regular 1,800 kcals/Nm^3, thus being easily usable in a steelworks by the addition, per ton of iron, of 35Nm^3 (1,230 cub. ft.) of blast-furnace gas at 950 kcals to the 78Nm^3 (2,730 cub. ft.) of recovered gas at 2,200 kcals.

Sensible Heat of Recovered Gases

Taking into account the air infiltration, the sensible heat of the recovered gases can be evaluated at 220,000−170,000=50,000 kcals. per ton of iron treated. A portion of these calories can be recovered, either in the form of a low-pressure steam or of hot water coming from the cooling system of the hood or the water circulating pipes. The use of a low-pressure boiler is, indeed,

specified in the two processes described above to produce the steam for assuring the safety of the gas circuits, as well as for the air-tightness of the joints and for feeding the injectors. Fig. 18 gives a diagram of the apportionment of calories during these tests. In any case, whatsoever may be the method which it is proposed to use for the recovered gases, the fact that they have only been subject to a very small amount of burning when leaving the converter gives a very great flexibility in use to the 200,000 kcal., approximately, thus stored in these gases per ton of iron treated.

NATURE OF DUST AND GAS-CLEANING PLANT

Technical publications furnish precise data on the brown smoke which is produced by the combustion in the ambient air of the gases coming from pure oxygen converters. In particular, it is known that the particles are very fine, of sizes less than one micron, sometimes agglomerated, and composed principally of iron oxides accompanied by a small proportion of impurities such as manganese oxide or lime.

As has been said, these data apply to samples taken "after" combustion of the gases. But in the reducing conditions which are to be found in the inside of the converter, it can be assumed that these particles consist to a large degree of metallic iron. This hypothesis has been proved by samples taken by IRSID from a 30-ton OLP converter at Denain. As the absence of a recovery hood allowed the gas to be taken from the inside of the converter nose, the dust collected was pyrophoric and its analysis gave contents of metallic iron (gamma iron) of 50 to 60 per cent., the balance being chiefly FeO. It should be stated that the presence of a small amount of nitrogen showed that penetration into the inside of the converter had not been deep enough to get to the fully reducing zone.

During these tests of gas recovery it was not possible to take samples from the inside of the converter: they were taken from the horizontal gas discharge tube at a spot where the temperature of the gases, injected with steam, was still 500 deg. C. The result of this was that the dust collected was saturated with water and had therefore to be stove dried, which prevented any granulometric analysis being made and also called for some qualifications as to chemical composition. Bearing these in mind, the results obtained can be given as follows:—Qualitative X-ray analysis showed up the presence of alpha-iron, FeO and traces of Fe_3O_4. Chemical analysis gave the following average results:—70 per cent. of total iron in metallic state: 25 per cent. as iron protoxide (FeO), the balance, say, 5 per cent., being in the form of magnetite (Fe_3O_4). Fig. 6 shows the unburnt and dust-laden gases being discharged direct from the blow-off chimney. This smoke is black.

As mentioned above, the gas cleaning plant consisted of a washing tower, followed by a venturi dust remover. The washing tower by itself resulted in a large part of the dust produced being removed. Thus, in Fig. 7, the torch on the left, corresponding to this primary gas cleaner, is giving a luminous flame with traces of black smoke.

The gas-cleaning apparatus, properly so-called, which dealt with 1,000 Nm^3 of gas/hr. (35,300 cub. ft./hr.), was of the Solivore type, with four venturis, with mechanical water spraying. Its load loss was only 190 mm. (7½ in.) head of water and, as it ran on closed circuit, the water consumption was only that necessary to replace losses. This apparatus proved very efficient and dust samples taken at its outlet gave concentrations lower than 15 mg./Nm^3 (0.65 gr./cub. ft.). In Fig. 7, the flare on the right, corresponding to the secondary dust-remover, is giving a very clear flame, without any sign of smoke. It would appear as if the nature of these particles helps in the dust removal and that decantation of the washing water takes place quickly. But these are observations of a purely qualitative nature and very many more comparative experiments with the usual brown smoke will be necessary before a conclusion is reached in this matter.

It should also be noted that, in this technique of trapping gases without combustion, no useful purpose is served by looking for a quantity of dust as low as if one were dealing with smoke already burnt in the converter nose. Indeed, as the later burning of the gas takes place in a large excess of air, a high content of dust is definitely not obtained in this smoke, even if the amount in the unburnt gas is relatively high. The small loss of load with the proposed dust-extracting plant, which would remain of the same order whatever may be the size of the industrial plant and the small volume of gas to be evacuated allow of the exhaust fan being of very small dimensions which leads to a small power consumption and low capital cost of the plant.

CONCLUSIONS

A first series of tests on the recovery of unburnt gases, produced by a pure oxygen converter, has been carried through at the pilot plant at Maizières-les-Metz, in close collaboration between IRSID and CAFL.

Two processes, for which patents have been filed, have been tried out on a 5-ton scale:—The CAFL process in which air-tightness between the recovery hood and the converter nose is obtained by means of a removable sleeve completed by means of steam injections, with a slightly lower presure maintained in the hood; the IRSID process in which a joint is left open between the hood and the converter and in which, by regulating the draught, a practically zero difference is maintained between the inside and outside of the hood at its base. The results of numerous gas analyses, made during refining, show that it is indeed possible to carry out this recovery without excessive entry of air and that the gases obtained under these experimental conditions have a CO content of the

(*Contd. on p. 1140, col. 2*)

ACCIDENTS AT MINES

Some Avoidable Instances

BRIEF accounts, based on reports of HM Inspectors of Mines, draw attention to some of the fatal accidents which might have been avoided during the closing quarter of last year.

On a conveyor face an underground fitter was loading wooden foot lids from a waste on to the conveyor when the roof above him collapsed displacing five GHH bars set on Union friction props. The fitter was buried by the fall and received injuries from which he died. The roof fall occurred towards the end of a coaling shift and extended from the caved waste edge, between a roadside pack and adjacent face strip pack, where a weak "slant" or "grind" was crossing the face. The uneven roof prevented some bars adjacent to the fall area being coupled together, and although two temporary props and lids had been set, the accident might not have occurred had chocks or temporary props and lids been erected as an additional precaution against the local weak roof conditions.

Killed by Fall of Waste

While reaching beyond the cover of two bar settings for material to complete his pack on a longwall face a packer was killed instantly by a fall in the waste. The majority of the waste supports had been withdrawn before the packs were completed, in contravention of the Support Rules.

At an inset to a shaft equipped with single-deck cages and rope guides a collier was about to step from a hinged platform on to a cage when the cage was raised unexpectedly and he was flung into the shaft and killed. The too-rapid transmission of a signal of "3" by the onsetter had caused a continuous signal of "1" to be received by the winding engineman. Notwithstanding this, if there had been compliance with the statutory requirements relating to the engagement of the automatic contrivance and the procedure for signalling as provided by Regulations 7 (2) and 29 of the Coal and Other Mines (Shafts, Outlets, and Roads) Regulations, 1956, there might not have been an accident.

A stoneman shovelling debris into a pack hole subsequent to the firing of a round of shots was killed by a stone which fell from the unsupported ripping face of a tailgate roadhead of a machine-cut advancing longwall conveyor face in a level seam with a sandstone roof. The permanent arch was 9 ft. 6 in. from the newly exposed face and two temporary props had been set to the newly exposed roof. This accident might have been prevented had the roadhead been supported in accordance with the Support Rules.

On a double-unit longwall advancing power-loaded face in a level seam, where 9 in. of coal was left to support a weak bind roof, an experienced packer withdrew a fully closed friction prop by striking with a hammer the uncoupled articulated bar to which the prop was set. There was an immediate fall of roof which buried the packer, who died in hospital. His life might not have been endangered if he had used the prop-withdrawal contrivance available nearby.

While two qualified mine electricians were preparing to connect an additional circuit breaker to the existing switchgear panel of a trunk conveyor unit below ground, one of them was electrocuted when he attempted to extract with a pair of pliers a connector pin left in the adaptor after the disconnection of the flit plug. The power had been cut off at the substation by a deputy, in response to a telephone message from the electricians, but was restored by him without thought when he realized that he had stopped a production unit. Observance of the requirements of Regulation 8 (3) of the Coal and Other Mines (Mechanics and Electricians) Regulations, 1956, might have avoided this accident.

A filler was buried under a fall of roof extending from the coal face to the waste edge on a level longwall middle-cut double-unit face, where conditions were adversely affected by previous workings in a seam 17 ft. below and coal filling had been delayed by breakdowns of the conveyor. The roof near the accident was supported only by bars on single props, and at places where the bottom coal had not been got up, by bars with two props parallel to the face. The accident might have been avoided if the working had been supported in accordance with the Support Rules by bars on two props made tight by lagging to the uneven roof.

An accident which might have been prevented had a proper scheme of maintenance and examination been in force as required by Regulation 7 of the Coal and Other Mines (Mechanics and Electricians) Regulations, 1956, occurred when an attendant at a surface power station was moving an electric light bulb connected to a 240-volt supply through a length of twin-core rubber-sheathed cable. His hand came into contact with the metallic socket of a defective porcelain screw-type lampholder.

FORTHCOMING EVENTS

MAY 23

Institute of Fuel: Meeting at the Institution of Civil Engineers, Great George Street, London, S.W.1, at 5.30 p.m. "Recommendations on Heights for New Industrial Chimneys," by G. Nonhebel.

MAY 24

Institution of Plant Engineers: Meeting at the South Wales Engineers' Institute, Park Place, Cardiff, at 7.30 p.m. "Controlled Maintenance," by G. E. Halter.

MAY 27

Midland Institute of Mining Engineers: Annual dinner at the Grand Hotel, Sheffield, at 7 for 7.30 p.m.

MAY 28

Mining Institute of Scotland: Annual general meeting at the Grosvenor Restaurant, Gordon Street, Glasgow, at 3.30 p.m.

MAY 29—JUNE 11

Iron and Steel Institute: Special meeting in Italy, including a joint meeting with the Associazione Italiano di Metallurgia in Milan on May 30 and 31.

JUNE 9

North of England Institute of Mining and Mechanical Engineers: Meeting in the lecture theatre of the institute, Neville Hall, Newcastle-upon-Tyne 1, at 2.30 p.m. "The Influence of Percussive Action on the Ploughability of Coal Seams," by Prof. E. L. J. Potts and F. F. Roxborough.

JUNE 29—JULY 1

Institution of Mining Engineers: Summer meeting in Cardiff. "The Degradation of Coal in Power Loading," by G. V. Standerline and Dr. S. Islwyn Evans, and "Pulmonary Disability Among Coal Miners, with Special Reference to the Pneumoconiosis Field Research," by John M. Rogan.

National Association of Colliery Managers

JUNE 1-3

Annual general meeting and conference at Southport (Lancs).

AUCHENGEICH COLLIERY FIRE

Observations by HM Chief Inspector

MAIN findings of HM Chief Inspector of Mines and Quarries (Mr. T. A. Rogers) as the result of the inquiry he conducted into the fire at Auchengeich Colliery (Lanarkshire) were given in last week's IRON AND COAL (p. 1094). Here are presented the Chief Inspector's full conclusions and recommendations, together with certain observations he makes in regard to the fire and its wider implications.

Auchengeich Colliery is situated at Chryston, in Larnarkshire, some 7 miles north-east of Glasgow. It is in the No. 3 (Central West) Area of the National Coal Board's Scottish Division. The mine is gassy. It has two shafts, each reaching the No. 2 Pit workings, where the accident occurred, at a depth of 360 yd.

At the time of the accident some 830 men were employed at the mine, producing about 730 tons daily. In the No. 2 Pit workings, there were 340 men (about 140 on each of the day and back shifts and 60 on the night shift) and the daily output was about 380 tons from the Meiklehill Main Coal and the Kilsyth Coking Coal seams. The night-shift men ascended between 6.00 and 6.30 a.m., and the day-shift men were lowered between 6.30 and 7.00 a.m.

Chief Inspector's Conclusions

In his report, published by the Stationery Office (Cmd. 1022, 5s.), Mr. Rogers concludes that the fire originated in the balata transmission belt of the electrically driven booster fan in the return airway from No. 2 Pit workings. The fire was caused by frictional heat generated between the rotating motor pulley and the belt, which had left the fan pulley and jammed near it. Flame from the belt ignited oil vaporized from the fan shaft bearings and oily deposits in and around the fan. The flame then spread downwind to ignite roadway timbers.

By tragic coincidence, 48 men riding through the return airway were overtaken by smoke containing carbon monoxide, and 47 of these men were asphyxiated.

The fire would not have reached disastrous proportions had inflammable material been excluded from a substantial length of roadway immediately adjacent to and on the return side of the fan.

The haze which preceded the smoke was not recognized, either by officials or by workmen, as a sign of imminent danger. By the time the fire was found the second man-riding train had already left the pit bottom.

Firefighting arrangements were inadequate, but the deficiencies did not contribute to the loss of life.

The fire would probably have been averted had the fan been under continuous supervision. It might have been averted or its development halted had the fan been inspected at the half-hourly intervals prescribed as a maximum by regulation.

Closer examination of belt performance after speeding up the fan might well have indicated the advisability of reverting to the previous speed or altering the drive.

The unsatisfactory performance of the belt and the damage done to it in the two days before the fire, particularly the night immediately before, received insufficient attention.

By calculation, a balata transmission belt made of 33½-oz. cotton duck put on after the speed-up of the fan had an excess capacity of about 50 per cent. and the 31-oz. belt which caught fire about 25 per cent. But the first of these belts lasted less than 10 weeks and the other only two days.

The belt which caught fire was not of the 33½-oz. weight ordered by the National Coal Board and failed to satisfy completely some of the tests prescribed by British Standard 2066.

Recommendations

The Chief Inspector makes the following recommendations:—

Underground booster fans driven by inflammable belts should be constantly attended by competent and properly instructed persons.

The bearings of underground fans should be lubricated with grease or any suitable non-inflammable lubricant that may be developed.

All power-transmission belts used at collieries should be made of fire-resistant material. Pending the introduction of fire-resistant flat belting, managers should make effective arrangements to ensure that any over-heating or fire in machinery, driven by an inflammable belt, will be discovered and dealt with before serious danger can develop.

All managers should carry out thorough reviews of their firefighting arrangements to ensure that sufficient appliances in proper working order will be available for prompt use in any place where fire may break out underground. These reviews should include consideration of telephone systems and means of warning men of fire.

All managers should have thorough examinations made of the whole of their pits to identify any places of unusually high fire risk and determine what can be done to minimize the risk at each of these places and to deal with any fire which may occur.

The attention of all officials should be drawn

specifically to their obligation under Regulation 11 (1) of the Coal and Other Mines (Fire and Rescue) Regulations, 1956, that men must be withdrawn as soon as there is any indication that fire has, *or may have,* broken out below ground.

The industry should reconsider its decision to discontinue the trials of self-rescuers.

There should be a suitably constituted standing committee of experts, representing all sides of the industry and the Ministry of Power, charged with the task of keeping under close and constant review the prevention of explosions and fires in mines, with particular reference to the lessons of actual fires and explosions in this country and abroad, and of anticipating any possible ignition hazards arising or likely to arise from new developments in mining practice.

No. 2 Pit Workings

Amplifying his report, the Chief Inspector states that in the No. 2 Pit workings there were two main roads running generally parallel in a southerly direction to the workings in the Main Coal and Coking Coal seams. The intake airway was used for the haulage of coal in tubs by endless rope and the first 925 yd. of the return airway for a man-riding haulage system. Apart from the connections near the pit bottom, there was a crosscut with air separation doors, commonly known as Johnston's Crosscut, some 1,125 yd. inbye. Two more crosscuts, each with doors, were provided farther inbye in the vicinity of No. 6 Bench, the branch haulage road leading to the Coking Coal sections.

The return airway from the Coking Coal sections crossed the main intake airway by an overcast and then joined the main return airway between these connecting crosscuts. The booster fan at which the fire occurred was in the return airway, a little farther outbye.

The Fan

The booster fan was of double inlet, forward-bladed, centrifugal type with a 45-in. dia. rotor driven by a flat belt. This type and size of fan is provided with 64 blades. The fan was not fitted with an evasée. The rotor shaft was carried on two white-metal bearings, oil ring lubricated and each with an oil capacity of about 6 pints. The cambered or "crowned" fan pulley was of 22½ in. dia., 12 in. wide, and overhung the bearing. It was driven at about 540 r.p.m. by a 100-h.p., flameproof, slip ring induction motor running at 730 r.p.m. The power supply was three-phase, 50-cycle, alternating current at 440 volts. The motor pulley, also "crowned," was of 16¾ in. dia. and 15 in. wide; the pulley centres were 15 ft. apart. The fan drive was fenced on the near side with 1-in. aperture steel wire mesh supported on an angle iron frame secured to a sidewall of the fan house. A timber covering or "catwalk," made from 9-in. by 2-in. battens, was placed over the belt to facilitate access to the nearest fan bearing.

The transmission belt was seven-ply and 12 in. wide. It was of a type known as balata belting, made of a folded high-tensile cotton duck and balata gum, neither of which is fire-resistant. In the absence of slip the belt speed would have been about 3,200 ft./min.

The fan was situated in a fan house in the main return airway, with the outlet casing mounted in a brick wall built across this roadway and with brick wall fairings to smooth the air flow into the two inlets of the fan. The motor was mounted on three slide rails which afforded a travel of about 7 in. for tensioning the belt. The circuit breaker and rotor starter for the motor were in the crosscut adjacent to the motor. A U-tube water gauge and an automatic indicator of the water gauge, situated near a haulage engine towards the intake end of this crosscut, indicated and recorded the ventilation pressure between the intake and the return airways. Three wooden doors in a by-pass roadway were designed to open automatically by change in ventilation pressure in the event of a fan stoppage.

The man-riding haulage was an endless underrope system of modern design in which each car or bogie was attached to the rope by an integral screw clip. The train comprised four bogies, each seating 12 men in three compartments having seats for four, two facing each way. The electrically driven engine, housed in the return airway, was provided with protection against over-running at each end of the haulage and against excessive speed; the position of the bogies throughout the journey was shown on an indicator and, at each end, by a warning stop light.

The Indication of Danger

In the light of subsequent knowledge it is difficult to understand why the haze observed at the pit bottom, and also inbye by the men on the first train, was not recognized as a symptom of an outbreak of fire, the Chief Inspector remarks. But it was not so recognized by anybody. It had no effect on the eyes, or on breathing and, although some of the men mentioned a smell, this was not sufficiently distinctive to be identified. Many of the men who saw the haze were experienced underground workers, but none was alarmed in any way.

The raw materials used in the manufacture of balata belting were known to be readily inflammable. An investigation was carried out at the Safety in Mines Research Establishment at Buxton to examine and demonstrate the degree of the fire hazard that may arise on balata belt drives. From this investigation it seems reasonable to deduce that a running balata belt is unlikely to develop dangerous heating so long as it stays on the pulleys and does not rub against a stationary object, Mr. Rogers states. If rubbing occurs, smouldering may possibly develop on the rubbing edge. But there is no doubt at all that a serious fire hazard arises when a balata belt stalls completely and remains on a rotating pulley; providing the tension of the belt is high enough it will smoulder and burst into flames in a current of air.

How the Fire Started

No one can say with certainty how the fire started and then developed, but considering the

evidence, including the results of the experiments made at the Safety in Mines Research Establishment, Mr. Rogers visualizes the course of events to have been generally as follows.

When the fan was left at about 5.30 a.m. on the morning of the fire, the power-transmission belt had become soft in parts and the balata had exuded to some extent. It had been further weakened by the cutting out of one ply over a length of about 3 ft. and the leading loose end of this ply would have had a tendency to ruck at the pulleys, thereby encouraging the belt to wander across them. Then, as had happened at least once before on this fan, the belt came off the fan pulley and jammed near it. The belt was stalled on the motor pulley and, there being sufficient tension to provide frictional resistance, the belt quickly heated up to the stages of smouldering and, eventually, flame.

If the belt did stall and become ignited by the revolving motor pulley, it would not have been long before it burned through and fell to the floor.

The ends would have continued to burn towards the fan pulley. The fan must have been stationary for some time before flame reached the inlet on the pulley side, but the exhausting fan on the surface would have continued to induce a brisk current of air through the booster fan even though the by-pass doors would have opened when it stopped. The air-flow pattern of the flames and the hot products of combustion would have resulted in the vaporization and ignition of the lubricating oil used in the fan shaft bearings and of oily deposits on the surfaces of the fan casing and runner. Flame issuing from the fan outlet would have been projected against and ignited similar deposits on the roof and upper part of the sides of the roadway near the fan and set alight the short wooden props and laggings. Thereafter, the fire would have spread very quickly to other props and laggings outbye.

There were thus three stages of combustion, probably overlapping each other to some extent:—(*a*) The belt; (*b*) oil from the bearings and oily dust in and around the fan; and (*c*) the wood props and laggings in the airway. The first two stages produced fumes and smoke which, being diluted, caused the haze in the return airway; the third stage produced dense smoke and carbon monoxide in dangerous quantities.

Rescue

There was a delay of at least 20 min. in calling for the services of the Central Rescue Station. If the call had been made immediately after the fire was discovered the rescue teams could not have saved life in this instance, but, says Mr. Rogers, this does not detract from the general principle that when as anyone in charge of a mine or part of a mine has reason to suppose that an emergency has occurred he should forthwith summon rescue men. No harm is caused if events prove a call to have been unnecessary.

The outcome of this accident might well have been less tragic if the men had carried and used self-rescue apparatus, the report states. Sir Andrew Bryan, then HM Chief Inspector of Mines, included in his report on the underground fire in 1950 at Creswell Colliery a recommendation that underground trials of improved forms of self-rescue apparatus should be expedited. Extensive trials were carried out over a long period under the auspices of the industry's consultative machinery but, after very careful consideration of the results, all parties agreed to discontinue the trials. In view of the circumstances in which the men at Auchengeich Colliery met their death, Mr. Rogers recommends that the whole question should again be reviewed by the industry.

Wider Considerations

Any fire below ground is potentially a very serious matter, the report states. In the case of a fan particularly, the high velocity of the air current tends to assist a rapid spread of flame. Booster fans, which must constitute a fire risk, should therefore not be used if adequate ventilation can be provided by any other means.

Where booster fans are unavoidably used, the management should take every possible step to reduce the risk of fire and to ensure that if fire breaks out it is suppressed with the minimum of delay. The use of belts which are not fire-resistant should be eliminated. Inflammable oil as a lubricant should also be eliminated; until this has been done, any surplus oil in the neighbourhood of a fan should be carefully removed. The roadway for a suitable distance, particularly on the downwind side, should be completely fireproof. There should be in readiness sufficient firefighting equipment in working order for immediate use and the man in charge of the fan should know how to use the equipment. Consideration should be given to the need for additional safeguards such as automatic devices for giving audible warning of over-heating and specially provided water sprinklers or curtains on the downwind side.

In some circumstances a forcing fan on the surface constitutes a similar danger and the recommendations he has made should be applied to forcing fans above ground wherever necessary, Mr. Rogers says.

A major advance in reducing the risk of fire underground stemmed from the Creswell Colliery disaster. Fire-resistant conveyor belting was developed and is now in general use. Power-transmission belting presented different problems, but the knowledge gained helped the development of fire-resistant V-belts. In 1955, the National Coal Board issued an instruction that only fire-resistant V-belts were to be used underground. The instruction was later extended to V-belts used anywhere at a colliery to prevent the possibility of belts intended for use on the surface being sent below ground. Fire-resistant flat belting is now being developed and the Chief Inspector is satisfied that it will not be long before there is available a type satisfactory in all respects. Power-transmission belts used on any underground machinery should be made of fire-resistant material as soon as satisfactory belting becomes available. Thereafter, no other material

should be supplied for use above or below ground. In the meantime, managers of mines should make effective arrangements to ensure that any overheating or fire in machinery driven by an inflammable belt will be discovered before danger can develop. Mr. Rogers was glad to hear at the inquiry that the tendency will probably be towards the elimination of flat-transmission belts underground.

Another point dealt with in the report on the fire at Creswell Colliery is mentioned by the Chief Inspector. The suggestion was made that where man-riding by rope-haulage takes place in return airways, arrangements should be made, where practicable, to ventilate the haulage engine house by intake air. The Auchengeich Colliery fire emphasizes the desirability of this, since the haulage engineman was compelled by the smoke entering his engine house in the return airway to leave his engine before the train on which the men were riding had reached the outbye terminus. This situation is better avoided, although it seems unlikely to have had any bearing on the accident.

The fire at Auchengeich Colliery started at a booster fan; that at Creswell Colliery in a conveyor installation. Before these accidents neither of these classes of plant had been regarded as particularly serious potential source of fire. Smaller fires have been caused by other underground equipment, and it is clearly most desirable that the considerations advanced in relation to the fire hazard at booster fans should be applied equally to all underground equipment which might be capable of causing a fire. The Chief Inspector, therefore, recommends every colliery manager to review his pit with the object of identifying every place of unusually high fire risk and of ensuring that there are adequate safeguards against the outbreak and spread of fire at each of these places. Careful consideration should be given to such precautions as the elimination of inflammable material, the proper maintenance of machinery, fire-proofing of roadways, and the provision, where appropriate, of automatic protection against heating and of early fire extinguishing.

Both the organization and the equipment for fire-fighting need careful consideration in the course of this review. A situation, as at Auchengeich Colliery, in which fire extinguishers are out of order when needed, or in which there is a delay of an hour or so before water can be applied through hoses to a major fire, cannot be tolerated, the Chief Inspector states. It was submitted at the inquiry that a considerable time might be lost in assembling sufficient trained men to operate a standard fire hose. This aspect of the arrangements should be carefully reviewed.

Finally, Mr. Rogers thinks there is a need for some additional means of correlating and keeping under constant review any lessons which are to be learned from the experience of fires, both at home and abroad, with a view to averting accidents from known causes. An equally necessary task is to endeavour to recognize in advance existing hazards hitherto unsuspected and fresh hazards which may come with rapidly changing mining practice. A great deal of work has always been done and continues to be done on these lines, but there is too great a tendency to look at each accident and each precautionary measure in isolation.

Following a sequence of explosions in 1956-57, the Safety and Health Committee of the Coal Industry National Consultative Council set up a Sub-committee on Mining Explosions which produced a most valuable report drawing attention to common features in a number of explosions which have occurred in recent years in this country. Some of these features have been brought to notice again by events since the report of the sub-committee was issued. Mr. Rogers recommends that there should be a small and active standing committee of experts from the industry and the Ministry of Power charged with the duty of keeping under constant review the potentialities of disaster from main causes such as fire and explosion.

Oxygen Refining of Iron

(*Contd. from p.* 1135)

order of 70 per cent. Still higher contents of CO could probably be obtained in industrial practice with large converters, on which the amount of air infiltration would be relatively less important.

Knowledge of the amount and composition of of the gases trapped during refining makes it possible to envisage a means of control of the refining operation, and, in particular, a useful indication of end of working, at least in the making of low-carbon steels. From the thermal point of view, the two processes enable a large number of calories to be recovered, of the order of 200,000 kcals. per ton of iron treated, in the form of a gas with a calorific value of at least 2,200 kcals./Nm³, which can be used with great flexibility. The gases, laden with dust composed of a high proportion of metallic iron, seem to be easy to purify and their small volume means an appreciable reduction in the overall size and the power consumption of the gas-cleaning plants.

These tests, on a pilot scale, must only be regarded as a preliminary stage, but they already form an important and indispensable starting point for more complete studies now in progress, in view of the industrial development of converters working with pure oxygen.

These techniques show an advantage in reduced capital cost and lower running expenses of the gas-cleaning plants, as well as the advantage from the thermal recovery. They can, therefore, only help to strengthen the already sound position of processes for the refining of iron by pure oxygen.

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Iron and Steel Institute

SPECIAL MEETING IN ITALY

Programme of Works to be Visited

FULL details of the Iron and Steel Institute's special meeting in Italy, from May 29 to June 11, were given in our March 18 issue (p. 634). A joint meeting with the Associazione Italiana di Metallurgia in Milan on May 30 and 31 forms part of the special meeting, and at the opening of the joint meeting the Giolitti Medal will be presented to Mr. W. F. Cartwright, president of the institute, by the president (Prof. Felice De Carli) and council of the assocation.

In addition to the technical sessions with the Associazione Italiana di Metallurgia and the programme of excursions arranged for members and their ladies, details of which were outlined in our previous reference to the special meeting, there will be opportunities to visit a number of Italian works.

Brief details of the works concerned are given below.

Breda Siderurgica S.p.A.

The old-established Società Italiana Ernesto Breda began the production of iron and steel during the first world war. By 1942 the company was producing 131,000 ingot tons annually, half of this tonnage being special steels. In 1951 the present company, Breda Siderurgica, was formed; it joined the Ilva group in 1959. It is concerned with ferrous and non-ferrous metals, its present output including the following:—

Highly alloyed special steels, that is, hardened carbon, tempered carbon, high-speed tool, stainless, heat-resisting, creep-resisting, nitrided, and bearing steels; pure iron for electrodes is also produced. Plain carbon and low-alloy steels, for all types of rolled products, forgings, and drawn products are produced.

The ironmaking plant comprises two Tysland-Hole electric furnaces, with a capacity of 100 ton/day each, supplied by 12,000-kVA transformers and charged with agglomerated ore and coal. The operation of these furnaces is seasonal, each averaging about 150 days' work per year, but they have been shut down for the past two years for economic reasons.

The steelmaking plant comprises:— Three 45-ton open-hearth furnaces, fired with natural gas and fuel oil; one 45-ton Maerz-type open-hearth funace fired with natural gas and fuel oil (built in 1958, it is the only one of its type in Italy and its special profile is designed to give better heat utilization and permits rapid relining); two 20/25-ton Héroult arc furnaces, supplied by 5,500-kVA transformers; two modern 40-ton arc furnaces, with removable roofs; one 5-ton modern arc furnace, with removable roof, for alloy-steel production.

The rolling-mill plant includes the following:— A 2-high 820-mm. reversible blooming mill, fully mechanized; a 600-mm. mill with four stands, designed for the rolling of billets; a 500-mm. mill, with four stands, the last of which can be converted to a universal stand for the production of beams; a 320-mm. double-duo mill, with six stands, which has been completely modernized and adapted for the rolling of special steels and sections; a multi-stand continuous mill, with three finishing trains, one for flat products (strip up to 300 mm. wide by 0.9 mm. thick), one for sections (channels, angles, etc.), and one for coiled products.

The forging department, set up in 1935 and greatly extended during the war, produces large and small forgings in special and commercial steels. The finishing departments are fully equipped for straightening, dressing, grinding, and heat-treatment requirements.

The present output of the plant is 300,000 ingot tons annually, of which about one-quarter is of special steels.

Stabilimenti di San Eustacchio S.p.A.

Starting as a small roll foundry 70 years ago at Brescia, the company's range of products is now very wide, includes special castings, for heavy industrial applications, including lathes for all purposes, planing machines, milling machines, straighteners, rolling mills, forging presses, railway material (cast-iron wheels and springs), and steel products. It employs the American Griffin process, under exclusive licence, for making chilled cast-iron wheels.

The foundry for rolls and large castings covers 14,000 sq. metres and consists of three bays, equipped with heavy overhead travelling cranes. The six reverberatory furnaces and three cupolas give a daily production of more than 1,500 tons of liquid iron. There is a special foundry for medium and small sized castings, with a monthly output of about 1,000 tons. There is also a 3-stand 450-mm. rolling mill and a forging shop.

The steelworks produces more than 3,000 tons of ingots per month for rolling and forging.

MARKING COILS WHILE STILL HOT AT THE CORNIGLIANO STRIP MILL.

Dalmine S.p.A.

Founded in 1906, this company comprises five works (at Dalmine, Apuania, Costa Volpino, Torre Annunziata, and Sabbio Bergamasco) for the manufacture and working of seamless and welded steel tubes, and an experimental department at Dalmine for the manufacture of plastic tubes. The Dalmine Works, which is to be visited by members, is the most important and largest of the company's plants. It produces seamless tubes in a very wide range of diameters up to a maximum of 925 mm. The equipment at the works includes two 45-ton arc furnaces and two 30-ton arc furnaces, and four 50-ton open-hearth furnaces. The open-hearths operate with 75 per cent. natural gas and 25 per cent. fuel oil. The melting shops produce carbon and alloy steels for all types of tube. Other plant at Dalmine includes a tubeworks, a cold-drawing shop. a pressure vessel department, and galvanizing plant.

Annual steel production capacity of the works is 600,000 tons, the annual tube production capacity being 550,000 tons. More than 7,000 workers are engaged at the works.

Innocenti Società per l'Industria Metallurgica e Meccanica

The Lambrate Works of Innocenti covers some 700,000 sq. metres and employs more than 5,000 people. There are two main divisions—the engineering division and the automobile division. The engineering division produces machinery and plant and may be subdivided as follows:—

The iron and steel making section comprises large electric steelmaking furnaces, hot deseaming equipment for ingots, blooming and slabbing mills, hot mills for bars and sections and for sheet and strip, cold strip mills, pickling and shearing lines, seamless tube mills, and auxiliary services. The machine-tool section includes large boring and milling machines and mechanical and hydraulic presses. The engineering division supplies complete integrated iron and steel works plant; its services have been used by iron and steel undertakings all over the world.

The automobile division produces small two- and three-wheeled vehicles with internal combustion engines. These include motor scooters, light vans, and the Lambretta motor-bicycle. The number of vehicles of this type produced is now well over 1,500,000 per annum. This plant was planned for a very high rate of production, and is laid out with completely automatic assembly lines and machine tools so as to give an output of a thousand vehicles per day.

The two divisions share the services of a research centre, with the most up-to-date equipment and a staff of technologists able to undertake the following work:— Development of new types of engine, development and construction of pilot plants for new processes, and physical, chemical, and metallurgical testing of materials and of metallurgical processes and products. The research centre includes a pilot plant equipped with machine tools, furnaces for melting and heat-treatment, a mechanical testing laboratory, and a physical chemistry and general physical laboratory (including spectrometry and microscopy), housed in a modern two-storey building.

Following a recent agreement between Innocenti and the British Motor Corporation, Limited, Innocenti is to produce several of the Austin and Morris models for the Italian market. This production will begin in the second half of this year.

Acciaierie e Ferriere Lombarde Falck S.p.A.

Acciaierie e Ferriere Lombarde Falck S.p.A. was founded in 1906, following the merging of the old Ferriere di Dongo and Ferriere di Vobarno and the more recent group of works at Sesto San Giovanni, Milan. It is now one of the leading Italian iron and steel producing groups.

The Sesto San Giovanni group of works includes four plants—Vulcano, Unione, Concordia, and Vittoria. Some details of the works are given below.

VULCANO (iron ferro-alloy works):— Outputs: Pig-iron, 110,000 tons; ferro-alloys, 30,000 tons; other products, 65,000 tons. Installed capacity: Reduction furnaces, 95,000 kVA. Products: Normal and special pig-irons for use in steelworks, foundries, and malleable plants; spiegeleisen; ferro-chrome, ferro-manganese, ferro-silicon, silico manganese, etc.; Söderberg electrode paste; granulated slag.

UNIONE (steelworks and rolling mills):—Outputs: Crude steel, 650,000 tons; hot-rolled products, 350,000 tons; other products, 30,000 tons. Installed capacity: Melting furnaces, 90,500 kVA. Products: Carbon and alloy steels, as ingots, semis, finished rolled products; bars, wire rod, rounds, hot strip, sections, rails; iron and steel castings; rolls; forgings; railway equipment; heavy and medium engineering equipment.

CONCORDIA (mills and tube works):— Outputs: Sheet and wide strip, 180,000 tons; welded tubes, 12,000 tons; nuts and bolts and other products, 15,000 tons. Installed capacity: Heat-treatment plant, 4,600 kW. Products: Heavy and medium sheet (hot-rolled), in carbon and alloy steels; wide sheets; large-diameter welded tubes; welded steel structures.

VITTORIA (mills):— Outputs: Cold-rolled strip, 60,000 tons; wire and cable, 10,000 tons; other products, 300 tons. Products: Sheet and strip, cold-rolled, in commercial and special steels; transformer sheet; steel wire, bright-drawn and galvanized; reinforcing bars; bright and galvanized cable and wire rope.

FIAT S.p.A.

Founded in 1899, under the name of Fabbrica Italiana Automobili Torino, the FIAT company has developed into the largest Italian motor-vehicle undertaking. FIAT also produces railway materials, large diesel engines for ships and industrial applications, aeroplanes, and aero engines. The company covers every aspect of the manufacture of its products, starting with the production of the metal and including all the engineering and assembly operations.

The Mirafiori Works is the largest and most up-to-date plant in the FIAT complex, covering 1,000,000 square metres. The bulk of the automobile constructional activity of the company takes place here. The automobile section produces an average of 550 vehicles per day.

The chief FIAT ironworks is in the Corso Mortara, Turin, and covers some 650,000 square metres. Its daily production is about 1,000 ingot tons. The installations include two electric furnaces for ironmaking, an open-hearth steel plant, and electric steel plant, rolling mills for sections, wide strip, and sheets, a spring department, a steel forge shop, and steel and bronze foundries.

Nazionale Cogne S.p.A.

Nazionale Cogne is a partly State-owned company with 9,000 employees. Its activities are based on the exploitation of the Cogne ore deposits, which produce a magnetite ore very low in impurities. Annual production is about 350,000 tons, which represents about 30 per cent. of the iron ore produced in Italy. The Cogne ore is mined with great care, using the most modern equipment so as to ensure the most thorough utilization of the ore and a high productivity.

The Aosta Works covers 1,000,000 square metres. The plant includes two blast furnaces, four electric pig-iron furnaces (12,000 kVA each), four 9-ton Bessemer converters, 11 arc furnaces, varying in capacity from 1 to 42 tons, and seven induction furnaces, varying from 1 to 10 tons. There are seven rolling mills:—A 1,000-mm. blooming mill, a 600/450-mm. mill, a 460-mm. mill, a 300-mm, mill, a 280/200-mm. mill, a 250-mm. wire-rod mill, a high-speed steel mill, and a wire-rod mill. The forging shops include a number of hammers and vertical and horizontal presses. Other installations include heat-treatment equipment, mechanical and electrical maintenance shops, a Söderberg electrode plant, wire-drawing benches, cold-rolling mills, etc. There is also a ferro-alloy department, with nine electric arc furnaces.

As a large user of refractories, the company has its own refractory plant at Castellamonte, which produces a wide range of aluminous refractories, enough to supply the company's need, with a surplus for sale outside.

Cornigliano S.p.A.

Originally planned in 1938 as an integrated steel plant to produce semi-finished products for re-rolling at other mills, construction of this plant at Cornigliano, to the west of the port of Genoa, suffered interruption due to the second world war. After the war, extensive modifications were made to the original plan, resulting from the increased demand for flat-rolled products and the success of continuous rolling mills. A company was formed, its shares being held by the Società Finanziaria Siderurgica (Finsider) and the Institute for Industrial Reconstruction (IRI), and known as Corgnigliano S.p.A. Erection of the plant began in 1950, and in November, 1953, the first coils were rolled. The ever-growing demand for the company's products

POURING UNDER VACUUM OF A LARGE STEEL FORGING INGOT AT SIAC.

has required further expansion; production in 1957 reached 1,000,000 ingot tons of steel and the increase is likely to continue.

The plant covers an area of about 10,000,000 sq. ft. three-quarters of which was reclaimed from the sea. The ironworks consists of three coke-oven batteries with a total daily production of 1,500 tons, two blast furnaces (750 ton/day each), and a sinter plant. In the steelworks there are six open-hearth furnaces of 250 tons each and full auxiliary equipment. The rolling mills comprise a slabbing mill, a 4-high universal reversing mill for plates and sheet bars, and a 4-high 6-stand continuous strip mill; in addition, there is one 4-high 4-stand continuous cold-rolling mill for coils and a 4-high reversing mill for sheets, together with a pickling line and auxiliary equipment. A continuous electrolytic tinning line was added recently to the five hot-dip tinning machines; there is also a Sendzimir continuous galvanizing line.

The products of Cornigliano are hot and cold-rolled sheets, strip, and coils, blackplate and tinplate, galvanized flat products, terne sheets, and aluminized sheets. The works is known as the O. Sinigaglia works, after Dr. Oscar Sinigaglia, who was responsible for much of the design, and under whose guidance the plans were carried to completion.

Società Italiana Acciaierie Cornigliano (SIAC)

In 1898 the Società Italiana Gio. Ansaldo built a foundry with a small steelworks on the banks of the Polcevera river; a machine shop was added later. This plant became increasingly important in the years preceding the first world war. The present company was formed in 1934, when the Ansaldo organization decided to separate its steel production plant from its other activities, and since that time SIAC has undertaken a comprehensive reorganization and replacement of its plant and equipment. The plant, which covers 370,000 square metres, is supplied with electricity from external power stations through an up-to-date transforming system; industrial water comes from wells, and natural gas is piped direct from the Po Valley deposits.

The steelworks comprises seven electric furnaces, two of 40 tons, two of 30 tons, two of 7 tons, and one of 1 ton, and two open-hearth furnaces, one of 80 and the other of 50 tons, run on natural gas or fuel oil. There is a modern vacuum-teeming installation used for the preparation of large forging ingots. The steelworks produces basic steel ingots up to 150 tons and molten steel for casting. All the steel produced is converted in the company's own mills, forging shops, and foundries.

The rolling mill is a 4-high installation for heavy plates up to 11 ft. 9 in. wide, 82 ft. long, and 8 in. thick. The forging department has presses of 8,000, 5,000, 2,500 (two presses), 1,000, and 600 tons, the two last-named being equipped for mechanical handling. There are also forming and straightening presses of 12,200, 4,700, 2,500, and 350 tons. The steelfoundry has two sections, one devoted to hand moulding and one to machine moulding, and can produce castings weighing up to 150 tons. It has an annual output of 10,000 tons.

In addition to the departments mentioned, there are also heat-treatment and machining departments, and control and research laboratories.

The steels produced include commercial and structural carbon steels, structural alloy steels, stainless steel, heat-resisting ferritic, non-magnetic, welding, austenitic heat-resisting for gas turbines. Typical products are heavy plates, forgings, and castings for hydro-electric power plants, power stations, nuclear plant, heavy machinery, shipbuilding and turbines.

Terni—Società per l'Industria e l'Elettricità

The Terni steelmaking and engineering plant began in 1884. It now covers over 1,000,000 square metres and consists of a group of plants, including steelworks, foundry, forging shops, press shops, rolling mills construction shops, machine shops, and heat-treatment shops with modern research and control laboratories.

The hydraulic forging presses are a feature of the works, ranging up to 12,000 tons. The construction department is also noteworthy; it is equipped for the manufacture of pressure vessels for the petroleum and chemical industries in various types of steel, including carbon, stainless, and alloy steels. The steelfoundry has much modern equipment for both hand and mechanized casting, and is supplied by a very up-to-date electric melting shop. Other plant at Terni includes an installation for the continuous casting of steel and a malleable iron plant. Being both a steelmaking and an electrical company, Terni is well equipped to undertake the installation of equipment in hydro-electric power stations.

ILVA—Alti Forni e Acciaierie d'Italia S.p.A.

The ILVA Company was formed in 1918, following the merging of a number of companies, including the SA Ilva, founded in 1905. Since 1937, ILVA has formed part of the Finsider group of companies. There are 15 ILVA works, spread all over Italy, from Naples in the south to Savona and Trieste in the north. It is the largest iron and steel making group in Italy. The largest of these works is that at Bagnoli, near Naples.

Bagnoli is an integrated works, and the only one in Italy producing basic Bessemer steel. It covers 1,353,000 square metres and employs over 4,000 people. Its products include wire rod, reinforcing bars, and sections, rails, hot strip, and ferro-alloys. This ironworks comprises two batteries of coke ovens, with a daily output of over 1,000 tons, ore-preparation plant, a sinter plant, and three blast furnaces (400 ton/day each). In the steelworks there are four 30-ton basic Bessemer converters, two 800-ton mixers, and four 65-ton open-hearth furnaces, run on coke-oven gas and fuel oil. The rolling mills include eight soaking pits, a 1,150-mm. roughing mill, a continuous billet mill, two heavy section mills, two medium and light section mills, a continuous rod mill, and a hot-strip mill.

COLLIERY MANAGERS' EXAMINATIONS

Central Examiners' Report on Answers

REPORT of the Central Examiners on the examinations for certificates of competency as managers of coal mines, set in November, 1959, and recently published by the Mining Qualifications Board, contains a fair measure of criticism of the answers given, but it was also possible for the examiners to give some praise to the replies. The questions were published in our issue of December 11, 1959 (p. 1074).

Of the 379 candidates who sat the examination, 141, or about 37 per cent., qualified. In addition, 46 candidates qualified for re-examination at the examination being held this month.

The following figures relate to the number of candidates who attended the examination at the various centres, and, in parentheses, the number who qualified for a First-class Certificate:—Glasgow, 49 (21); Sunderland, 60 (23); Doncaster, 112 (44); Wigan, 45 (13); Cardiff, 57 (16); Stoke-on-Trent, 56 (24).

Winning and Working

Output of 2,000 tons required on two shifts from four fully mechanized faces.—Only a small number of candidates attempted this question. While a few had a good grasp of what was required, the majority showed a lack of awareness of the necessity to make surge capacity available in a pit whose output was produced from fully mechanized faces.

Methods in use for the correlation of coal seams.—Although this question was of a straightforward nature, it was not popular and the answers were not up to the standard generally expected from this question.

Advantages and disadvantages of (a) hydraulic props; and (b) friction props.—This question was answered by the majority of candidates and the answers were generally good. The sketching, however, in most cases was unsatisfactory and in many instances incorrect.

Main factors which can affect the rate of progress in shaft sinking.—The majority of candidates who answered this question gave good answers and showed that in the matter of shaft sinking at least, advantage had been taken of the many papers that have recently been published on this subject.

Methods of supporting the main roadway of a working face.—This was a very popular question and answered by most candidates. For such a simple practical question, however, the answers were not of the standard that one would have expected. Many candidates gave as an answer three different types of arch girders and some depended far too much on roof bolting in what must be considered a very important area of support in longwall working.

Principal advantages and disadvantages of skipwinding.—While the first part of this question was generally well known and well answered, far too few candidates had made themselves aware of the simple methods that can be used to load skips of the small capacity given in the question. Sketching again in this question was not satisfactory.

Principal advantages and disadvantages of short-delay firing, pulsed-infusion firing, and compressed-air blasting.—This question was well answered, although a few candidates had only a hazy knowledge of the technique of compressed-air blasting. Descriptions of the first two methods of firing, however, were well known.

Chief factors governing the site and size of two shafts to be sunk.—This question was a popular one and very well answered.

Ventilation

Airflow produced in the mine by two fans.—This question was attempted by a few candidates. The majority of these attempts indicated only too clearly that candidates' knowledge of this aspect of ventilation is sparse, many candidates ignoring completely the P/V curve which was an essential part of the answer. Some good answers were given, however.

Advantages and disadvantages of descensional ventilation.—Most candidates attempted this question. The answers, which were generally fairly good, indicated that some candidates at least were reading current technical literature. In only a few answers, however, was a majority of the relevant factors taken into account in the discussion.

Calculation of the airflow in a long heading ventilated by means of an auxiliary fan.—Although this question was similar to one set in a recent examination, it was badly answered by most of those attempting it. Many candidates assumed information not given in the question, so making it unnecessarily complicated and, as a result, making arithmetical errors. The most common mistake was to assume that the area of rubbing surface in both ducts was the same. This question could have scored high marks, but lack of fundamental knowledge resulted in low markings.

Factors influencing the layering of firedamp in mine roadways.—A question attempted by most candidates, who generally scored reasonable marks. This question also showed that candidates had studied recent technical articles and reports on the subject. It appeared that the NCB Information Bulletin which summarized existing knowledge on the subject had been seriously studied and understood by only a few; however, the serious implications of this occurrence in the pit seemed to be well appreciated.

Function of a mine air-conditioning plant.—Very few candidates chose to answer this question. Those who did showed very little knowledge of a mine air-conditioning plant.

Control of the emission of gas from an extensive, sealed-off area of old workings.—This was a popular question and moderately well answered. About half the candidates who answered it would attempt to prevent the gas emission by the generally impracticable method of sealing off the area by means of cementation, sand-packs, etc. Most of the remaining candidates discussed the use of pressure chambers, but few showed

any real understanding of how pressure chambers function.

Use of a Pitot tube to measure air pressures.—A knowledge of the meaning of, and relation between total, static, and velocity pressure is essential for an understanding of mine ventilation, and particularly of auxiliary ventilation, but few candidates showed by their answers that they possessed such a knowledge. Many candidates lost marks by describing the measure ment of pressure losses in mine airways.

Difficulties and dangers which might arise when the airflow in a mine is reversed.—Most candidates answered this question, which concerns a problem on which any manager might have to take a decision in an emergency, yet few appreciated all the factors which must be taken into account, and especially those which are of most importance. Few candidates seemed to appreciate the great difficulty of a manager obtaining sufficient information as to the position underground in the event of a large fire in an intake shaft or airway, to enable him to decide whether or not to reverse the airflow, and to enable the airflow to be reversed, in sufficient time to be of help to men on the return side of the fire.

Explosions, Underground Fires, and Inundations

Precautions to be taken in a seam which is very liable to spontaneous combustion—This was not a popular question, and some very variable answers were given. The advantages of scouring or packing a crossgate from the intake to the return some short distance behind the boundary line while the face was still working were not appreciated by many candidates. The planning, supervision, and reporting were not covered adequately in most cases.

Dealing with a large fire in the vicinity of the loading point in the intake airway.—This question was more popular, but, apart from a few exceptions, the answers were very poor. Some candidates made no attempt at all to fight the fire and very few attempted the preparation of stoppings while actual firefighting was taking place. Some candidates suggested alterations of ventilation, which might have been very dangerous under the conditions which they envisaged.

Organization and methods that may be employed to ensure that the dust raised into the air in every road of a large safety lamp mine shall, when tested, be rendered safe.—A fairly popular question which produced some very poor answers. Many candidates had only a very sketchy idea of what was required to answer this fairly straightforward question.

Modern methods of dust suppression and how the results can be measured.—A popular question which resulted in higher markings than any of the other questions. In many instances, the second part of the question was very badly answered. In fact, few candidates had a good knowledge of the measurement of airborne dust.

Dangers and precautions to be taken when boring an exploratory hole in search of water.—Many candidates had only a very sketchy idea how to answer this question and some poor marks resulted. They tended to consider only the danger of flooding and ventilation problems were often neglected. There were a few good answers.

Means adopted to prevent ignitions of firedamp caused by electrical apparatus in mines.—This was the most popular question, but the answers generally were far from complete. In some cases, candidates gave incorrect facts.

Explanation of a system of firedamp drainage.—Some candidates answered this unpopular question very well, but others gave very poor answers and showed little knowledge of modern techniques of firedamp drainage. The second part of the question was often poorly answered. This is a subject on which there is much recent literature and candidates are advised to study it carefully.

Building up, training, and deploying an efficient organization for firefighting.—Again, not a popular question, but in general, those who attempted it gained more than average marks. Candidates should familiarize themselves with the board's policy regarding firefighting organizations.

Machinery

Storage, dispensing, and purpose of different grades of lubricating oils—Many answers to this unpopular question described systems with which the candidates were familiar, and showed appreciation of the necessity for a well-regulated system controlling the receipt storage, and issue of lubricating oils of various types. Some answers did not make it clear that the main purpose of a lubricant is to reduce friction, and that the viscosity of the oil required may depend on the pressure between the moving parts, and on whether a system of forced lubrication is used. A number of candidates described the uses of other oils, such as diesel fuel and transformer oils.

Description of a system of multi-rope friction winding.—This was not a popular question and many of the answers were disappointing. Sketches, in general, were poor, and some candidates described such systems as ground mounted Koepe winders.

Calculation of acceleration time and of horsepower at consent speed for locomotive haulage.—This question was attempted by rather more than half the candidates, but very few correct answers were submitted. Some candidates were unable to find the force available for acceleration, while some, having found this force, had not sufficient knowledge of elementary dynamics to complete the problem. In calculating the horsepower to maintain a constant speed of 6 m.p.h., some candidates assumed that the locomotive was exerting its maximum tractive effort.

Factors influencing choice of type of haulage.—This was a popular question and was answered at some length by many candidates. Some seemed to be satisfied with a track for endless-rope haulage being laid and maintained to comparatively low standards, and gave this as an advantage over locomotive haulage in that it was less expensive. The probability of the reorganized mine having a considerable length of life was not always appreciated, and none considered the possibility of using the equipment elsewhere should the mine have a shorter life than originally estimated.

Factors to be considered when estimating size of cable.—A number of good answers showed that some candidates had studied this subject. While it was realized that a cable of bigger cross-sectional area would reduce transmission losses, few candidates suggested that the cost of the cable and the cost of transmission losses should be considered together. The numerical part of the question was not well answered, some candidates attempting to calculate the size of conductor as though it were in a d.c. circuit.

Causes of low power factor and methods of power-factor improvement.—The causes of low power factor inbye, and the means of improving it, was generally well understood. Some candidates attempted to explain power factor by means of vector diagrams, and became confused in the process, often using incorrectly terms such as inductance, reactance, and power.

Effect of running an electric motor at about half full load.—This was a popular question. Many candidates were aware that the practice of installing motors too

big for the duty they have to perform is one of the main causes of a low power factor, although a few stated that the power factor would be improved or that the electrical system would not be affected. Some candidates thought that the motor would run at a dangerously high speed or would burn out. The effect on the efficiency of the motor was often not mentioned.

Control gear and 3-phase motor for direct rope haulage.—Some answers were good, but some were very poor. Some candidates thought that a speed controller controlled the voltage applied to the stator of a slip-ring motor. A few made no provision for speed control or reversing. One or two candidates appreciated the heat generated and power loss substained when using a face-plate, drum, or liquid controller, and suggested the use of a mechanical gearbox with a squirrel cage motor, and although this device was not intended in the question, suitable marks were awarded for these descriptions.

Surveying, Levelling, and Drawing

Plotting outcrop.—There were surprisingly few correct answers which warranted full marks to this question. Some candidates found the dip and direction correctly, but failed to plot the outcrop. Others correctly plotted the outcrop on one side of the fault, but were incorrect on the other side.

Conditions of adjustment of dumpy level and completion of level book.—This question was attempted by the majority of the candidates and, in general, the completion of the level book was satisfactory, although a few candidates failed to apply the usual checks. The conditions of adjustment were not known by many candidates and others wasted time by describing the method of adjustment.

Underground use of various surveying instruments.—This question was moderately well answered, particularly in the uses of the miner's dial, theodolite, and dumpy level, although some candidates recited the uses on the surface.

Calculation of survey.—Only a few candidates attempted this question. Methods were generally correct, but careless errors resulted in incorrect results.

Information to be shown on plan of abandoned mine.—Although attempted by about 60 per cent. of the candidates, only a few wholly correct answers were given. It was obvious that many were guessing and few were conversant with the relevant Regulation.

Tonnage yield.—The most popular question and generally correctly answered.

Base line measurement.—The few candidates who attempted this question gave poor answers and only a small number had any idea of base line measurement.

Curve calculation.—This question was attempted by about 50 per cent. of the candidates and good marks were generally obtained.

Mining Legislation

A repairer was fatally injured when a direct rope broke allowing a set of trams to run away.—This was a popular question, but a large majority of the candidates did not appreciate that the most important part of the question dealt with the breaking of the rope. In fact, a surprising number did not even deal with this aspect.

Workman entering an abandoned heading and lighting a match causing a violent explosion.—This question was generally well answered, but very few candidates appreciated that the violent explosion was probably associated with a contravention of the Dust Regulations.

Provision, use, and maintenance of sanitary conveniences.—This question was generally well answered.

Gearhead being moved into line when a fall of roof and sides dislodged the roadhead supports.—The necessity to use a separate anchor prop for the Sylvester was appreciated and the general standard of answer was reasonable.

Law relating to telephone and signalling apparatus at a mine.—There were some very good answers to this question, although there was confusion between a.c. and d.c. circuits.

Regulations regarding the installation of auxiliary fans.—There were some very good answers to this question and the only weakness appeared to be a proper definition of an auxiliary fan.

Plans to be kept at the office of the mine and the details which are required to be shown on them.—This was a popular question, but candidates did not appear to have any knowledge at all of the Surveyors and Plans Regulations, 1956. This matter does not appear to have been dealt with by technical colleges.

Use and maintenance of safety lamps.—This was not a popular question, but those candidates who attempted it obtained fairly good marks.

Mining Technology

High-speed shaft sinking.—The answers showed a fair knowledge of improvements recently introduced in shaft sinking processes. Some candidates had obviously studied the IME symposium papers.

Installation of mine cars and diesel locomotives.—This question should have produced better answers than those received. The operation has been carried out many times in the last few years and there is plenty of literature on it.

Controlled drainage of methane from old workings.—Few candidates answered this question well and many knew little of the methods which are being used and ignored the fact that the seam was said to be liable to spontaneous combustion.

Comparison of three types of gate conveyors.—The answers were moderately good.

Strip packing, solid stowing, total caving.—The most popular question in the paper and one which gave candidates a chance to gain marks. Only a few answers were really satisfactory, and sketches generally were vague.

Colliery workshops and stores.—This was very badly answered and drawings were deplorable. Only one candidate tried to show a shops' layout with provision for proper work flow.

Dirt production and disposal.—A popular question, answered better than most of the others, but not enough was known of methods to stop tips getting on fire.

Coal-preparation plant.—This was an unpopular question and only attempted by a few candidates. The first part of the question was ignored by practically all. Flow-sheet drawings were fairly good.

Construction of shaft inset.—The few answers received were generally poor. This was a practical problem, and the attempts showed little knowledge of the best method of tackling it.

Vol. 1, No. 1

First issue of the TBE Bulletin, published by the mineral processing division of Baker Perkins, Limited, Blackhorse Road, Letchworth (Herts), in association with Israel Mining Industries Laboratories, Haifa, expresses confidence "that those concerned with the processing of ores, or the separation of solids one from another, will find in it information and data of technical assistance to them in applying TBE (tetrabromoethane) to their separate problems." It is intended to publish the bulletin at regular intervals.

New Literature

NEW catalogues, booklets, and other publications which have recently been received include the following, which are acknowledged with thanks.

JOY-SULLIVAN, LIMITED, 7, Harley Street, London, W.1—The company, which formed an air power division last year to manufacture and market a range of air compressors and pneumatic tools, has published the first issue of the division's newsletter, Air Power News. Its contents are attractively produced and will interest all users of compressed air.

JOHN SUMMERS & SONS, LIMITED, Hawarden Bridge Steelworks, Shotton, Chester—First edition of the John Summers Review is a four-page publication with colour front and back pages. To be issued quarterly, the publication will provide information on the application of sheet steel, particularly the company's plastic-coated steel, Stelvetite.

COSELEY BUILDINGS, LIMITED, Lanesfield, Wolverhampton—Full-scale production of aluminium houses, complete with verandahs and car ports, which can be erected by six men in 12 days, has started at the company's works. They are intended primarily for oversea. Details of the houses are given in an attractive brochure.

SONDES PLACE RESEARCH LABORATORIES, LIMITED, Dorking (Surrey)—The facilities offered by the Sondes Place Research Institute for sponsored research and development in chemistry, chemical engineering, mechanical engineering, and related subjects are outlined in an attractive booklet containing many photographs in colour.

SIMON-CARVES, LIMITED, Cheadle Heath, Stockport—The company has produced an interesting brochure on "Steelmaking and Electro-precipitation." There are sections on open-hearth furnaces, converters, electric-arc furnaces, sinter plant, scarfers and deseamers, and dust disposal.

PATERSON HUGHES ENGINEERING COMPANY, LIMITED, Bedford House, Strand, London, W.C.2—Leaflets describing the company's new 1-ton electric hoist block and general goods handling equipment are now available. The electric hoist block was among the exhibits shown by the company at the recent Mechanical Handling Exhibition at Earls Court.

BROCKHOUSE ENGINEERING, LIMITED, Victoria Works, Hill Top, West Bromwich—Brockhouse torque converters were first used in this country in 1942. A new brochure outlines the development in the applications of the units.

PYRENE COMPANY, LIMITED, Great West Road, Brentford (Middx)—April-May issue of The Bonderizer, published by the metal finishing division of the company, is devoted to cold forming applications of the "Bonderite" process.

FREDERICK BRABY & COMPANY, LIMITED, Braby House, Smithfield Street, London, E.C.1—Braby of Britain News, a 20-page magazine, combines two former publications and presents an interesting picture of the company's technical and social activities.

SUTCLIFFE ENGINEERING INDUSTRIES, LIMITED, 28/29, Savile Row, London, W.1—Under the title "Getting Together" the group has published a booklet setting out the activities of the various constituent companies, all of which are based in Yorkshire and which, of course, include Richard Sutcliffe, Limited, pioneers of underground belt conveying.

MOND NICKEL COMPANY, LIMITED, Thames House, Millbank, London, S.W.1—Abstracts of literature on nickel-containing heat- and corrosion-resisting materials form an interesting feature of the March issue of the Nickel Bulletin.

INTERNATIONAL COMPUTERS & TABULATORS, LIMITED, 149, Park Lane, London, W.1—The fourth issue of ICT contains a variety of interesting articles and features on the group's activities at home and abroad.

MOBIL OIL COMPANY, LIMITED, Caxton House, Tothill Street, London, S.W.1—April issue of the Mobil Industrial Review, which makes extensive use of colour printing, is devoted to resources of the sea. "Minerals from Sea Water" is among the features of a very interesting issue.

GOODYEAR TYRE & RUBBER COMPANY (GREAT BRITAIN), LIMITED, Wolverhampton—An article—"250 Years of Ironmaking"—on the 250th anniversary of the founding of the famous Coalbrookdale Company, Limited, is among the contents of the April issue of the Goodyear Industrial Products News.

BRADLEY & FOSTER, LIMITED, Darlaston (Staffs)—Articles on electric-arc furnaces and chains and chain-making are among the features of the spring issue of Bradley's Magazine.

DAVID BROWN INDUSTRIES, LIMITED—News from the many divisions of the parent company and the associated and oversea companies in the group is attractively presented in the April-June issue of Newsletter.

STANTON IRONWORKS COMPANY, LIMITED, near Nottingham—A photograph in colour of swans on the Nutbrook Canal—and in the heart of the New Works area, too!—makes a very attractive cover for the April issue of The Stantonian, which is always as interesting as any of the industrial magazines.

FISCHER & PORTER, LIMITED, Salterbeck Trading Estate, Workington (Cumberland)—An excellent catalogue has been produced giving full details of the company's "Flowrators," which are suitable for applications involving pressures and capacities in excess of those covered by the Fischer & Porter range of standard variable-area flow indicators catalogued in a separate equally useful publication.

W. C. HOLMES & COMPANY, LIMITED, Turnbridge, Huddersfield—In order to provide an alternative bag filter suitable for less arduous duties than the recently introduced Holmes-Retroflux design, the company's gas cleaning division has commenced manufacture of Holmes-Standard bag filters. They are described in publication No. 83.

STURTEVANT ENGINEERING COMPANY, LIMITED, Southern House, Cannon Street, London, E.C.4—Publication No. 2304—a 60-page production—gives full details of the company's products and supersedes a previous similar publication.

British Electrical Power Convention

ANNUAL meeting of the British Electrical Power Convention will be held at the Pavilion, Bournemouth, from May 30 to June 2 under the presidency of Viscount Chandos, chairman of Associated Electrical Industries, Limited. Theme for this year's meeting will be "The New Horizon." The subject will be covered in four papers dealing with electrical manufacture, electricity supply, electrical export, and electricity in the home.

The convention is representative of all the principal organizations—41 in number—connected with the British electrical industry.

Mechanical Handling of Conveyor Belt

MANY advantages are to be obtained by delivering to collieries lengths of conveyor belting completely ready for underground use. Previously, preparation of such belts, including the fitting of end joints, has called for the use of a relatively large labour force and considerable floor space, particularly where large quantities of conveyor belt are handled.

In order to solve the problems associated with such work, Hayden-Nilos, Limited, Sheffield, has introduced the three machines detailed below. The machines, which are designed to work in conjunction with each other, or separately, as required, provide a completely mechanical means of belt preparation, including inspection, provision of exact lengths, and end jointing, giving complete control of bulk supplies and a far higher degree of belt jointing efficiency than is possible if this latter operation is carried out underground at the point of usage.

Power-driven Belt Jointing Machine

This machine, as shown in Fig. 1, includes a power-operated belt squaring and cutting attachment to ensure a perfectly square belt end with minimum loss of belt. Micro switches automatically control the starting and stopping of the cutting blade. The belt end is held in spring-loaded clamps to take belt thicknesses from $\frac{1}{4}$ in. to $\frac{3}{4}$ in. The clamping bar is marked to indicate the correct number of jointing hooks to be used according to the width of belt being handled.

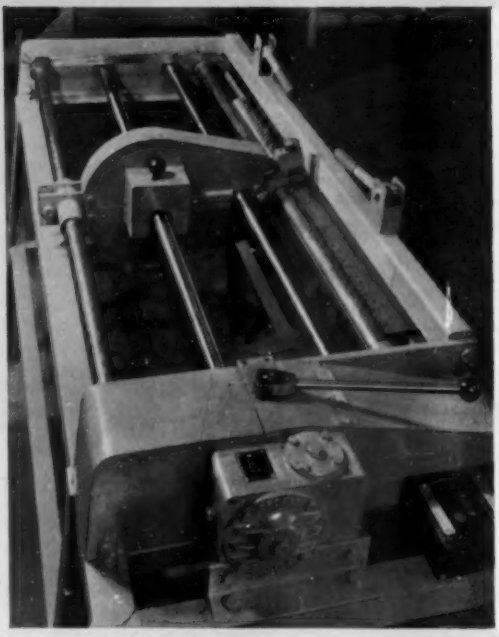

FIG. 1.—POWER-DRIVEN BELT JOINTING MACHINE.

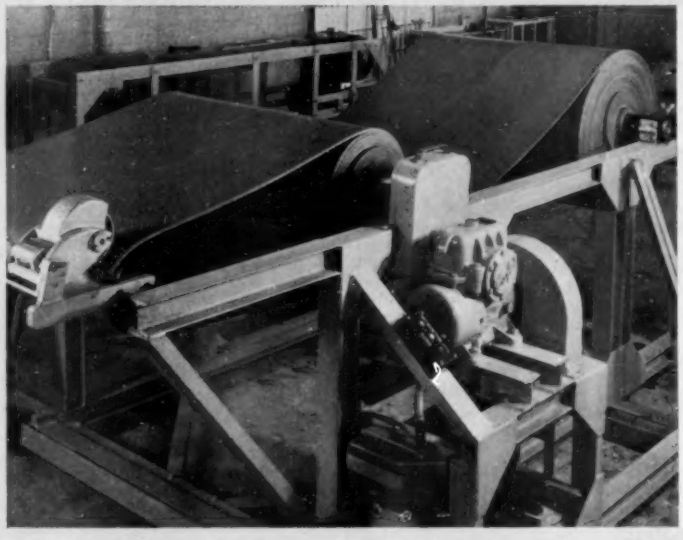

FIG. 2.—MACHINE FOR RE-ROLLING CONVEYOR BELT.

The jointing and traverse mechanism are jointly operated by one switch and the machine is so designed that the jaw mechanism cannot overrun after the joint is completed. The jaw mechanism is continually lubricated, running in an oil bath. All switches on this machine are interlocked to avoid duplicate operation of the cutting and jointing sections of the unit. Power is provided by a 2-h.p. motor, running at 1,420 r.p.m. through a 15:1 reduction gearbox. A 30-in. wide belt can be jointed in 60 sec.

Belt Re-rolling Machine

The belt re-rolling machine (Fig. 2) is designed to re-roll conveyor belt for visual inspection at the same time as the required length is extracted from the roll, the machine being fitted with a footage recording meter for this purpose. The end

of the belt, having previously been jointed, is clamped to two eccentric collars on the free shaft of the machine and is lightly tensioned to ensure even lapping and a tight, truly circular roll of minimum diameter.

Power is provided by a 2-h.p. motor, running at 940 r.p.m. through a 30:1 reduction gearbox. A wrapping speed of approximately 37 ft./min. is obtained according to roll diameter.

Belt Cutting or Trimming

The third machine in this range (Fig. 3) is designed to remove damaged portions of conveyor belt.

Frequently, conveyor belt wear is limited to the edges of the belt and it is found that, by removing these damaged edges, the reconditioned material can be used again. For example, belting removed from gate conveyors can be further used on the coal face after trimming the worn edges. This machine is very simple and positive in operation. The power-driven rollers are adjustable for all thicknesses of belt, as are the vertical cutting blades. The front loading bar is marked in inches to assist in locating the position of the cutters and informing the operator of the exact width of the belting being recovered.

This machine is powered by a 1-h.p. motor with an integral gearbox. The cutting speed is 15 ft./min.

All the machines described above are designed to handle belts up to 42 in. wide, and it is considered that they form a complete belt-handling section suitable for belt stores or large collieries and call for the minimum labour force for such work.

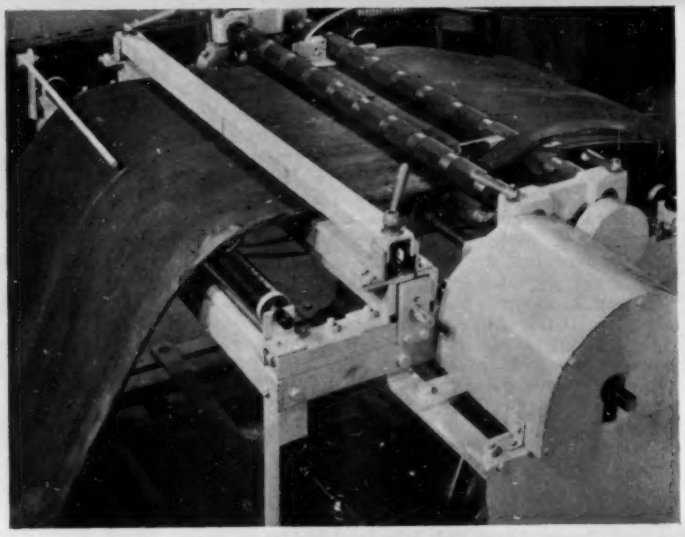

FIG. 3.—BELT-CUTTING OR TRIMMING MACHINE.

British Association Annual Meeting

The 122nd annual meeting of the British Association for the Advancement of Science will be held in Cardiff from August 31 to September 7 under the presidency of Sir George Thomson, FRS, Master of Corpus Christi College, Cambridge. The title of his presidential address will be "The Two Aspects of Science." The association is visiting Cardiff this year for the third time, previous meetings having been held there in 1891 and 1920. The Lord Mayor of Cardiff is chairman of the local general committee, Dr. Anthony Steel, Principal of the University College of South Wales and Monmouthshire, is vice-chairman. Sir Frederick Rees is chairman, and Sir Reuben Pugsley, vice-chairman, of the local executive committee. The honorary secretaries of the local general committee are Mr. S. Tapper-Jones and Mr. E. R. Evans.

BS for Rolling Stock in Mines

NEED for a British Standard to deal with the principles of design and the specifications of components of mineral rolling stock was agreed by the BSI Technical Committee formed to prepare a revision of BS 413, which dealt with steel tub wheels for use in mines. The new standard, BS 3237:1960, published by the British Standards Institution, price 15s., is a more comprehensive standard and replaces the former BS 413.

In preparing standard requirements for the complete vehicle, care has been taken to avoid details that would restrict design. Hence the specification for bodies, underframes, and certain items of drawgear deal mainly with principles and basic requirements essential to a product of good quality.

The range of wheel sizes for both fixed and loose wheels has been considerably reduced, compared with the National Coal Board specifications, by eliminating the ¼-in. increments of size. A new series of wheel numbers has therefore been introduced and it is intended that the BS number will gradually replace the NCB numbers through the medium of purchasing based on this standard. Hooks for drawgear are of trapezoidal cross-section to comply with other hooks in other British Standards and to take account of conditions operating in haulage drawgear.

AFTER 50 YEARS in the mining industry, Mr. David Henderson Wilson has retired. He began his career as a surface worker at Cowie Pit before joining the office staff and he later transferred to Plean Colliery where he has remained ever since, latterly as a finance representative.

British Iron and Steel Industry Translation Service

FOLLOWING is a list of some new translations available from the Iron and Steel Institute under its translation service scheme. Translations are all classified by numbers, and these should be quoted on application, which should be addressed to the institute at 4, Grosvenor Gardens, London, S.W.1. Further lists will appear from time to time.

1496: "The Velocity of Sound as a Characteristic Value for the Quality of Cast Iron" (from German). R. Ziegler and R. Gerstner. 24th International Foundry Congress, 1957 (6), 133-157. £4 15s.

1518: "The Reactions Occurring in the Blast Furnace as Seen from the Kinetic Point of View." G. Heynert and J. Willems. Stahl u. Eisen, 1959, Oct. 29, pp. 1545-1554. £5 10s.

1542: "Research on the Rolling Process." I. M. Pavlov. From Metallurgiya S.S.S.R. 1917-1957, ed. I. P. Bardin, Moscow, Metallurgizdat, 1959, vol. 2, pp. 56-81. £8.

1620: "Electrochemical Polishing of the Internal Surfaces of Tubes." E. Stockl. Blech, 1959, Oct. £2.

1627: "Precipitation Processes in Austenitic Chromenickel Steels and their Effects on Susceptibility to Intergranular Corrosion" (with discussion). H.-J. Wiester, *et al.* Arch. Eisenhüt., 1959, May, pp. 299-309. £10.

1628: "Stress Field as a Fundamental Tool in Crane Design." W. Kloth, Stahl u. Eisen, 1960, Feb. 4, pp. 159-164. £4 10s.

1629: "Wear Resistant Surface Layer Welding Using a Horizontal Plate Electrode" (translated from a German version). B. M. Kontorov and N. V. Popova. Svaroch. Proizv., 1959 (9), pp. 27-30. £2 5s.

1633: "On Hot-cracking of Austenitic Chromium-nickel Welds." W. Hirsch and H. W. Fritze. Schweissen u. Schneiden, 1956 (3), pp. 81-85. £4.

1636: "Organic Solvents in Flame Spectrometry." A. Puschel and S. Eckhard. Arch. Eisenhüt., 1959, Dec., pp. 731-735. £3 10s.

1637: "Possibility of Co-existence of Stress Corrosion and Pitting Corrosion in Mild Steels." W. Rädeker. Arch. Eisenhüt., 1959, Dec., pp. 747-750, £2 10s.

1638: "A New Method of Producing Manufactured Articles Directly from a Melt." A. V. Stepanov. Vestnik Mashin., 1959 (11), pp. 47-49. £3 5s.

1642: "Determination of Tantalum in Titanium Alloys by Ultraviolet Spectrophotometry." D. M. Dokkina and E. I. Petrova. Zavods. Dab., 1957 (4), pp. 421-422. £2.

1649: "The Balance-sheet of an Experimental Melt in an Oxygen-blown Converter." P. Ya. Sorokin. Stal, 1958, Nov., pp. 987-992. £4 5s.

1554: "The Volatilization of Iron (II, III) Oxide, Manganese (II, III) Oxide, and Chromium (II, III) Oxide." H. von Wartenberg. Arch. Eisenhüt., 1959, Oct., pp. 585-587. £2 15s.

1564: "Works Tests on Power Requirement in the Ehrhardt Process for Manufacturing Tubes." A. Geleji, *et al.* Acta Techn. Acad. Scient. Hungaricae, 1958 (3-4), pp. 395-412. £6 15s.

1630: "Mechanical Properties of Seamless Tubes in Low-carbon Steels." V. Kravcenko. Stahl u. Eisen, 1959, Nov. 26, pp. 1801-1803. £1 15s.

1643: "Diagrams for Isothermal Transformation Valid for Some Swedish Standardized Tool Steels." G. Molinder. Jernkon. Tekn. Rad. Meddelanden, 1954 (203), pp. 263-290. £5 15s.

1651: "The Fall in Steel Temperature During Continuous Casting." V. Y. Genkin and O. A. Shatagin. Metallurg, 1959 (11), p. 17. £3.

1456: Deformation of the Work Material in Cross-rolling." M. Ya. Brovman. Pp. 22-33. £4 5s.

1480: "Secondary Condition of Axial Engagement in Oblique Rolling." P. K. Teterin. Pp. 133-138. £2 15s.

1499: "Increasing the Life of Mandrels for Cold Tube Reducing Machines." I. Yu. Korobochkin, *et al.* Pp. 151-159. £3 5s.

1481: "Study of Wall Deformation During the Hot Reducing of Tubes." V. L. Kolmogorov and A. Z. Gleiberg. Pp. 171-179. £3 5s.

1491: "Reducing Welded Gas and Water Piping in a Three-roll Reducing Mill." G. I. Gulyaev, *et al.* Pp. 180-187. £3 5s.

1503: "Methods and Apparatus for Measuring the Thickness and Width of Hot- and Cold-rolled Strip." G. Münch. Stahl u. Eisen, 1959, Oct. 29, pp. 1601-1615. £9 15s.

1540: "Research into Material for Drill Pipe Casings with a Minimum Yield Strength of 98 kg./mm.²" R. Sejnoha. Hutnické Listy (Prague), 1959 (9), pp. 829-840. £8.

1586: "Surface Roughness of Hot-worked and Cold-drawn Steel Tubes," (1) Basic considerations, influencing factors, and definitions; (2) Development of surface quality in hot working (Ehrhardt process); (3) development of surface quality in cold-plastic shaping. H. Mühlenweg. Stahl u. Eisen, 1959, Nov. 26, pp. 1792-1800 (1, 2); Dec. 10, pp. 1844-1852 (3). £10.

1605: "Blast-furnace Lines and Design of Charging Equipment." H. T. Brandi, *et al.* Stahl u. Eisen, 1960, Jan. 21, pp. 65073. £5 10s.

"Continuous Casting of Steel," papers from Proc. 1st All-Union Conference, Oct. 17-19, 1955; Moscow Akad. Nauk, 1956:—1609: "Investigation of the Quality of Continuously Cast-steel Ingots." N. A. Nikolaev. Pp. 49-61. £6 10s. 1610: "Design of the Continuous Casting Plant at Novo Tula." V. P. Druzhinin. Pp. 62-66. £2 15s. 1611: "Investigation of the Quality of Continuously Cast Steel." N. L. Komandin. Pp. 73-83. £5 15s. 1613: "Basic Factors Affecting the Technology of Continuous Steel Casting with a Moving Mould." I. Ya. Granat. Pp. 145-155. £5 5s.

1635: "A Simpler Chlorine Vacuum Separation Technique" (with discussion). W. Koch and O. Gautsch. Arch. Eisenhüt., 1959, Dec., pp. 723-730. £5.

1660: "Effect of Prestressing (Residual Stresses) Upon the Behaviour of Rimmed Basic Converter Steel Subjected to Hot Dipping." H. Wiegand and F. Nieth. Metalloberfläche, 1959, Nov., pp. 346-350. £3 15s.

1664: "The Distribution of Copper and Tin Between Molten Iron and Lead and the Effect of Other Elements on It." H. Schenck and W. Prieker. Arch. Eisenhüt., 1959, Nov., pp. 641-648. £5 10s.

1687: "Contribution to the Study of the Forgeability of Steels." G. Remy. Centre Doc. Sidér., Circ. Inform. Tech., 1955 (12), pp. 2413-19. £2 5s.

"Electropolishing, Anodizing, and Electrolytic Pickling of Metals." N. P. Fedot'ev and S. Ya. Grilikhes. Moscow, 1957, p. 285, 81 figs., 60 tables. £2 18s. ($8.40), plus postage.

Non-ferrous Metals

Strikes Affect Lead and Copper

LEAD is the firmest market in London and cash metal is experiencing a squeeze which has carried the price to its highest level since November, 1957. The outlook is good and has been helped by the strike at Bunker Hill's Idaho mine. The possibility exists of this strike spreading to other US producers. American demand is satisfactory and the price is unchanged at 12 cents a pound.

Zinc is still sensitive in London, demand is patchy, even for prompt metal, and prices have eased. In the US demand is much better for both "Prime Western" and for special high-grade metal. The price is still called 13 cents a pound.

So far as copper is concerned consumers seem content to wait and see what the outcome will be of the present situation in Chile. El Salvador and Potrerillos mines are still on strike, but there has been no extension to other mines. Reports now indicate that the Chilean Copper Confederation has resumed negotiations with the company and hopes are that the strike will be settled.

This news came on top of Union Minière, the big Belgian Congo copper producer, lowering its price by B.frs 1.50 per kilo to B.frs 35.50 per kilo and the outbreak of disturbances in the Rhodesian Copperbelt. Accordingly, the London price structure weakened and the backwardation closed further to around £5 a ton. Moreover, stocks are still increasing and until a definite trend emerges, the outlook is for the market to continue to drift.

The US market continues slow and although producers report better business than the custom smelters, the market, on balance, is quiet. The price of 33 cents a pound is still applicable to custom smelters and to producers.

Tin is a good market in the East, dull and featureless in London, and quiet in New York where the price is still below $1 a pound. One good factor in the market has been the announcement by the chairman of the International Tin Council that the UK stockpile of tin had been liquidated by the end of March this year. From the US comes the news that in February last, consumption decreased by 2 per cent. but that stocks at the end of that month were down to 37,960 tons, compared with 39,635 tons at the beginning.

Official metal prices in London yesterday (Thursday) were:—COPPER, Standard: Prompt £250, forward £244 15s. TIN, Standard: Prompt £785 10s., forward £786. LEAD: Prompt £77 15s., forward £77 2s. 6d.; ZINC: Prompt £92, forward £92.

Black Bolt & Nut Hearing

THE Restrictive Practices Court will begin hearing evidence on an agreement between members of the Black Bolt and Nut Association of Great Britain on Monday.

When the agreement was mentioned in the Court last December it was estimated that the hearing would last 10 working days.

PERMISSION to add a third bay to its chain production works at Cannock is being sought by J. & J. Wiggin, Limited, ironfounders, etc.

British Industry Goes on Show in New York

REASONS why New York was chosen for the 1960 British Exhibition next month were given at a Press conference in London on Tuesday by Sir Norman Kipping, director-general of the Federation of British Industries, joint sponsors of the exhibition with the Dollar Exports Council. He said that the potential market for British exports to the United States was still large despite a 200 per cent. increase in sales there in the past 10 years.

Last year, he said, $1,000,000,000 worth of British goods had gone to the United States and $600,000,000 worth to Canada. These figures represented respectively $6 and $36 a head of population in the two countries. It was clear that there was plenty of room for improvement in exports to the United States.

Millions of dollars' worth of Britain's finest industrial products, representing many industries, are now on their way by sea and air to New York for the exhibition, which will be the biggest Britain has ever staged abroad. Lord Rootes, chairman of the Dollar Exports Council, arrived in New York this week to complete plans. With Mr. W. H. McFadzean, chairman of British Insulated Callender's Cables, Limited, and president of the Federation of British Industries, Lord Rootes is joint chairman of the exhibition.

The Duke of Edinburgh will open the exhibition in New York's vast Coliseum on June 10.

US Steel Output Still Falling

DECLINE in US steel output continues. Production fell from 92 per cent. of capacity in March to 80 per cent. last month, and steel executives fear that operations may fall below 70 per cent. of capacity by the middle of the year. Most consumers, including car manufacturers, are cutting stocks.

Steel output tonnages in the US during April fell from 11,564,683 in March to 9,771,000, according to the American Iron and Steel Institute. Output in the first four months of the year reached a new peak of 44,511,983 tons, compared with 41,769,911 tons in the corresponding period last year.

Industrial output in the US last month held steady at almost 2 per cent. below the January peak established in the wake of the steel strike. The Federal Reserve Board estimates its output index at a seasonally adjusted 165 (1947-1949=100).

Shipyard Promotions

NEWLY-APPOINTED general manager at the Neptune Yard of Swan, Hunter, & Wigham Richardson, Limited, of Wallsend-on-Tyne, is Mr. Tom Christie, shipyard manager there since 1954. Mr. Christie served his apprenticeship with Hawthorn, Leslie (Shipbuilders), Limited, of Hebburn-on-Tyne, where he became assistant shipyard manager. He joined the Neptune Yard in the same capacity in 1952.

He is succeeded as shipyard manager by Mr. Sidney Atkinson, who served his apprenticeship with John Readhead & Sons, Limited, of South Shields, and went to the Neptune Yard as assistant manager in 1954. Mr. John D. Hadfield, technical manager, who has been at the Neptune Yard for 51 years, has been made personal assistant to Mr. P. Denham Christie, managing director of the yard.

In Parliament

NCB and Small Mines

MP ALLEGES "DISGRACEFUL TREATMENT"

ALLEGATIONS of the National Coal Board's "disgraceful treatment" of those employed in the small, licensed mines of South Wales were made by MR. STEPHEN DAVIES (Lab.). In an uninhibited attack, Mr. Davies accused the board of deliberately and irresponsibly imposing "crippling financial penalties" and said: "The attack on the small mines is only one of many ignoble steps which have been taken in the board's 13-odd years of existence.

"It is, as I indicated," he continued, "destroying the confidence of the miners and the mining communities in the industry. The board has been far more concerned with satisfying such a Government as this than in making the mining industry a success."

After referring to cuts imposed on the output of small mines, MR. DAVIES said that in addition to this "disastrous imposition," the board demanded royalties of from 4s. to 6s. a ton and also a deposit from each licensee. "Neither in the working nor the marketing of their coal have these small mines been helped by the board in any way. These demands are made by a body, which accepted huge open-cast schemes without a word of protest which have driven thousands of miners out of the deep mines in South Wales and other parts of the country," he said.

The Anomaly

In his own constituency [Merthyr Tydfil], there were a dozen small mines where nearly half the men employed had been written off because of the conditions imposed by the board. Furthermore, he continued, many of these men would not return to the deep mines because of age or injuries received while working in them. Mr. Davies spoke of the number of small mines working anthracite—the scarcity of which had reached famine proportions. "But the board is determined to destroy them," he declared.

"This disastrous, contradictory, and ever-changing policy of the board has characterized its administration during the last several years."

Replying, MR. JOHN GEORGE, Parliamentary Secretary to the Ministry of Power, said that unemployment of miners in South Wales did not present a problem generally. The initial purpose of the board's treatment of the small mines was to stop, if possible, the anomalous position that while the NCB had seriously to reduce output year after year, the small mines were raising theirs substantially.

A representative delegation of small mine owners which had met the board and the Ministry, he said, had not once mentioned the question of increased royalties. They had resented the output reductions originally ordered, however, but finally agreed on maximum outputs more than the original figures. The vast majority of small mine owners, MR. GEORGE went on, had accepted new licences incorporating the quotas. The board also had power to give a 10 per cent. hardship allowance where necessary and had given an open quota enabling small mine owners to produce all the anthracite they liked.

No one in his senses, MR. GEORGE continued, would suggest that any production of derivatives from coal would consume millions of tons a year. "But the board is not so unmindful of its responsibilities as not to be looking into this matter and we at the Ministry are keenly aware of the problem."

MR. RUPERT SPEIR (Con.) is seeking permission to introduce a Bill to transfer the licensing of small private mines from the board to an independent organization. His plan also provides for the maximum labour force in private pits to be increased from 30 to 200.

FEARS ON SHIPBUILDING

REMARK made in a recent speech by Lord Hailsham, Minister of Science, that perhaps the future of shipbuilding in the United Kingdom lay in fewer and larger units could not be construed as Government policy, said MR. R. A. BUTLER, the Home Secretary. He added that he did not think that wider fears expressed on the rationalization of the industry were likely to be realized.

Mr. Butler said that Lord Hailsham's speech consisted largely of a number of rather fundamental questions about the future of the industry. When MR. GAITSKELL (Lab.) asked for Government policy on the question and DAME IRENE WARD (Con.) asked Mr. Butler to make it clear he was disowning Lord Hailsham's observations, the HOME SECRETARY said it was better that the Government should examine the fundamental problems raised by the Minister for Science than to ignore them.

MINERS IN THE FORCES

CONCERN at the "marked increase" in the number of young miners who had left the coalfields since 1957 to join the forces was expressed by MR. NORMAN PENTLAND (Lab.). He appreciated that miners made first-class servicemen, but they left the coalfields because of a profound sense of insecurity, and he feared the industry would soon have serious manpower problems unless the drift away was stopped.

MR. HAROLD WATKINSON, Minister of Defence, said in reply that the statistics showed a considerable increase in some areas but not so much in others. "I will certainly take note of what he says about the coal-mining industry itself," he said.

Board Changes

Davy-United Names New Production Director

IN view of his retirement next year, Mr. Frederick G. Phipps has relinquished his appointment of production director of DAVY & UNITED ENGINEERING COMPANY, LIMITED, Sheffield, but will remain a director, and also on the boards of Davy & United Roll Foundry, Limited, and Davy & United Instruments, Limited. Mr. Phipps joined the then Davy Bros., Limited, as an apprentice in 1907. In 1957 he was appointed production assistant to the managing director of Davy & United Roll Foundry and last year became director in charge of production of Davy & United Engineering.

He is succeeded as production director by Mr. Stephen Baker, previously works manager of Davy-United's Darnall Works. Mr. Baker joined Davy-United as a post-graduate apprentice in 1947. In 1953 he became sales engineer, and then successively deputy works manager and works manager of Darnall Works. The new manager at Darnall is Mr. Walter Hatcher, formerly manager of the machine and erecting shops there.

STEEL & COMPANY, LIMITED—The chairman, Mr. James Steel has joined the board of Rea Bros., Limited, private bankers.

KEITH BLACKMAN, LIMITED—Mr. E. W. A. Richards, who has been appointed a director, retains his appointment as company secretary.

HEATRAE, LIMITED—Mr. A. H. Freeman has been elected chairman and managing director in succession to the late Mr. C. H. Smith.

JOHN LYSAGHT'S SCUNTHORPE WORKS, LIMITED—Mr. P. J. Cockram has joined the board and also that of Scunthorpe Rod Mill, Limited.

JESSOP-SAVILLE (SMALL TOOLS), LIMITED—Mr. J. R. Bottomley, Mr. E. Garlick, Mr. D. Milne, and Mr. J. F. Wallace have been appointed to the board.

JOHN BAKER & SONS, LIMITED—Mr. A. T. W. Taylor has joined the board. Mr. Taylor was inadvertently referred to in last week's issue at Mr. A. T. W. Baker.

BRUNTONS (MUSSELBURGH), LIMITED—Mr. C. C. Mitchell, director of research and development with Brown Bros. & Company, Limited, Edinburgh, has joined the board.

H. J. ENTHOVEN & SONS, LIMITED—Mr. C. T. Hill has been appointed chairman from June 30, in succession to Mr. A. M. Baer who is resigning from the board to limit his commitments.

GUARDIAN ASSURANCE COMPANY, LIMITED—Sir Peter Roberts, chairman of Newton, Chambers & Company, Limited, former Master Cutler, and Conservative and Liberal MP for Sheffield, has joined the board.

HUMPHREYS & GLASGOW, LIMITED—Mr. R. Langford and Mr. I. H. Phillipps, who are associate directors, have been elected to the board. Mr. G. Adams and Mr. R. J. Withers have been elected associate directors.

F. W. BERK & COMPANY, LIMITED—Mr. Claude H. Tanner has been elected chairman in succession to Mr. Arthur D. Berk who is retiring after 18 years as chairman. Mr. Berk will remain on the board until September 5.

BAKER PERKINS (EXPORTS), LIMITED—Mr. H. Crowther, formerly managing director, has been appointed chairman. Mr. Crowther is also vice-chairman of the board of management of Baker Perkins, Limited, the parent company. The new managing director is Mr. H. S. Hargreaves, deputy managing director. Mr. A. I. Baker, chairman of the parent company and former chairman of the export company, will continue as a director.

AMAL, LIMITED—Mr. St. J. Elstub has been appointed deputy chairman. In addition to being a director of the company, he is also joint managing director of the metals division of Imperial Chemical Industries, Limited, the parent company.

METAL PRODUCTS COMPANY (WILLENHALL), LIMITED—Following the death in January of Mr. G. T. Whitehouse, Mr. John W. Whitehouse has been appointed chairman. Mr. John J. T. Whitehouse, Mr. Alfred C. Whitehouse, and Mr. James T. Whitehouse have been appointed directors.

£100,000 Foundry Training Appeal

TRUSTEES of the National Foundry Training Centre, West Bromwich, are today (Friday) launching an appeal for at least £100,000 to meet the cost of their proposals to rebuild the centre and enlarge the hostel. The sum would also provide an endowment to ensure that benefits available remain at the disposal of the industry in the future. About £50,000 of this would, it is estimated, be absorbed by building costs.

A statement by the Joint Iron Council says that by acting now, the foundry industry hopes to offer the kind of training facilities likely to attract boys of good calibre. The centre, the only one of its kind in any industry, has a capacity of only 12 to 14 boys at one time. The present building is deteriorating and a centre is needed capable of training double the number of boys.

Apprentices from all sections of the industry would be able to profit from improved equipment, and a lecture room, lockers, and shower baths are among other planned amenities. There is, the statement continues, a steadily increasing demand for foundry technicians because of the progressive mechanization and development of quality control. Many foundries cannot now offer facilities to give the essential basic craft training and it is intended to provide such training at the new centre.

Since the centre was set up in 1949, 574 apprentices from 183 firms had received training there by the end of last year.

Stanton Ironworks' Canadian Subsidiary Reorganized

CANADIAN subsidiary of the Stanton Ironworks Company, Limited, near Nottingham, until now a selling company only, has been reorganized as a manufacturing company. A substantial minority interest in this subsidiary, Stanton Pipes (Canada), Limited, has been acquired by the National Steel Car Corporation, Limited, of Hamilton, Ontario.

The reorganized Canadian company is planning to establish a new plant at Hamilton on land and in buildings acquired from the National Steel Car Corporation, to manufacture spun iron pressure pipe. Production is scheduled to start early next year. The initial investment involved in this venture is about $5,000,000.

Company News

£4,000,000, RIGHTS ISSUE

Metal Industries Plans Capital Increase

PLANS to raise about £4,000,000 by a rights issue of ordinary shares are being considered by Metal Industries, Limited, London, S.W.1. The issue is primarily to replace the overdraft facilities granted by the company's bankers during the recent acquisition of Lancashire Dynamo Holdings, Limited. The cash part of the acquisition cost about £5,500,000, including expenses, but as £2,000,000 was available from short-term investments and other resources, there remains about £3,500,000 on overdraft.

It is proposed to increase the authorized capital of the company from £10,000,000 to £15,000,000 by the creation of an additional 5,000,000 shares of £1 each to enable the issue to be made. An extraordinary meeting will be held on May 30 to increase the authorized capital.

The terms of the issue have not been indicated. For the year to March 31, 1960, the board has forecast a total dividend of 15 per cent., of which 6 per cent. has already been paid as an interim.

MOSS GEAR COMPANY, LIMITED—Interim ordinary dividend is raised to 4½ per cent. on capital increased by a one-for-five scrip issue (3¾ per cent. equivalent).

WILKES BERGER ENGINEERING COMPANY, LIMITED—Final dividend of 9d. a 5s. share makes 1s. (9d.) for 1959. The net profit was £41,100 (£35,205), after tax of £44,205 (£34,709).

AMALGAMATED METAL CORPORATION, LIMITED—Final dividend of 8 per cent. makes 11 (9) per cent. for 1959. Group net profits rose to £584,604 from £405,160, after tax of £420,048 (£412,502).

JAMES PICKUP & COMPANY (TEXTILE MACHINERY), LIMITED—The company, a subsidiary of J. H. Peck & Company, Limited, has acquired 96 per cent. of the issued capital of the Eclipse Mill Company, Limited.

THOMAS MARSHALL & COMPANY, (LOXLEY), LIMITED, fireclay refractory manufacturers, of Loxley, near Sheffield—Group net profit for 1959 was £115,520 (£85,742), after tax of £88,104 (£91,716). A dividend of 15 per cent. is declared.

WILLIAM COOK & SONS (SHEFFIELD), LIMITED—Final dividend of 12½ per cent. makes 22½ per cent. for the year ended March 31, 1960, on capital increased by a three-for-five scrip issue (equivalent to 15¾ per cent.). Group profits were £106,064 (£102,246).

RADIATION, LIMITED, London, W.1—A dividend for 1959 of 10 (6) per cent. is recommended, supplemented by a bonus of 2 per cent., which derives from 1959 profits. After tax deductions, the total available for appropriation is £2,171,157 (£1,016,736).

H. J. ENTHOVEN & SONS, LIMITED, lead smelters and refiners, etc., of London, S.E.16—Group profit for the year was £71,578, against a loss of £66,927, subject to tax of £229 (credit £360). A dividend of 6 per cent. is to be paid. The last dividend was 20 per cent. in 1954.

MASSEY-FERGUSON (UNITED KINGDOM), LIMITED—Reviewing the trading results of the six months to the end of April, 1960, the president, Mr. A. A. Thornbrough, said that the company had sold more tractors —38,500—than any other UK manufacturer to the domestic and export markets combined. Minor alterations in the working week for some factory departments would be necessary because of an adjustment in the number of tractor component sets being supplied to North America and Yugoslavia. During the period of readjustment from June 1 production of complete tractors would be running at the rate of 324 a day.

LAMBERT BROS., LIMITED, coal exporters, etc., of Cardiff—With a final of 17½ per cent., the less-tax dividend is raised to 22½ (17½) per cent., but there is no capital distribution this time against a total of 4½ per cent. Group net profits increased from £231,647 to £311,659.

WADKIN, LIMITED, manufacturers of woodworking machinery and pattern-shop equipment, of Leicester—Group profit for 1959 was £153,366 (£159,913), after tax of £151,850 (£151,725), and the final dividend of 6 per cent. makes 10 per cent. for the year (9½ per cent. equivalent).

BRITISH ELECTRIC TRANSFORMER COMPANY, LIMITED —The offer by C. P. Properties, Limited, to purchase all the £1 5 per cent. cumulative preference shares has been accepted by the holders of more than 90 per cent. in value of the total shares issued and the offer is therefore unconditional.

THOS. FIRTH & JOHN BROWN, LIMITED—An interim dividend of 5 per cent. on account of the year ending September 30, 1960, is to be paid on capital increased by a one-for-four scrip issue—an effective rise of 1.8 per cent. The 1958-59 final dividend was 6 per cent. on the present capital.

COWLISHAW, WALKER & COMPANY, LIMITED, iron-founders and manufacturers of coal-face machinery, and power presses, of Stoke-on-Trent—Dividend for 1959 is 20 per cent. on capital increased by a one-for-three scrip issue (15 per cent. equivalent). Net profit, after tax, dropped to £112,419 (£135,191).

GARRARD ENGINEERING & MANUFACTURING COMPANY, LIMITED—Net profits for the year ended January 31, 1960, dropped from £281,128 to £146,975, after tax of £107,280 (£264,462). The final dividend of 6 per cent. makes 10 per cent. on capital increased by a two-for-three scrip issue (equivalent to 12 per cent.).

ROWE BROS. & COMPANY, LIMITED, sheet lead rollers and lead pipe manufacturers, of Exeter—A doubled final dividend of 10 per cent. for 1959 restores the 15 per cent. total rate in force prior to the 1958 cut to 10 per cent. Net balance is more than doubled at £118,979 (£55,876), after tax of £99,540 (£63,417).

RICHARD JOHNSON & NEPHEW, LIMITED, wire drawers and rollers, of Bradford—Final dividend of 7½ per cent. makes 11 (9) per cent. for the year ended March 31, 1960. Group net profits reached a record of £1,087,688

(£885,798), after tax of £850,811 (£811,560). Special profit-sharing bonus to employees absorbs £35,000 (same).

J. BROCKHOUSE & COMPANY, LIMITED, drop forgers, ironfounders, etc., of West Bromwich—Interim dividend is raised to 4 (3) per cent. for the year to September 30, 1960. The previous year's final was 7 per cent. For the half-year to March 31, 1960, estimated profit, before tax, is £544,874 against £368,545 for the corresponding period last year.

TRIEFUS & COMPANY, LIMITED, manufacturers of industrial diamonds, etc., of London, E.C.1—Final dividend on preferred ordinary of 10 per cent. is proposed with a further dividend of 2½ per cent., making 22½ (20) per cent., and 11½ (10) per cent. on ordinary for 1959. After UK tax of £76,652 (£59,240), net profit was £63,857 (£38,314).

RIVET, BOLT & NUT COMPANY, LIMITED, Glasgow—The directors have invited the Board of Acton Bolt, Limited, London, N.W.10, to consider whether a fusion of the interests of the two companies can usefully be effected. The matter will be discussed after an exchange of information and shareholders will be informed of any definite result.

EVER READY COMPANY (GREAT BRITAIN), LIMITED—Agreement has been reached with the majority shareholders of Compagnie Industrielle des Piles Electriques (CIPEL), for the company to acquire a substantial interest in that company for the purpose of mutual development and expansion of their respective battery interests in France and French oversea territories.

C. C. WAKEFIELD & COMPANY, LIMITED, manufacturers of lubricating oils and equipment, of London, W.1—The dividend is raised to 2s. 9d. (2s. 3d.) a 10s. unit with a final of 2s. for 1959. A one-for-two scrip issue is proposed. Consolidated net profits rose from £1,467,035 to £1,834,813, after tax of £1,648,539 (£1,572,937). The company proposes changing its name to Castrol, Limited, as from August 2.

MELLOWES & COMPANY, LIMITED, metal window manufacturers, etc., of Sheffield—Dividend for 1959 is raised by 1½ per cent. to 20 per cent., with a final of 13½ per cent. It is proposed to increase the authorized capital to provide for a proposed one-for-one scrip issue and to enable the company to raise any additional capital when considered desirable. After tax of £100,527 (£121,332), group net profit fell from £115,741 to £95,960.

RAWLPLUG COMPANY, LIMITED—After tax of £438,474 (£350,159), group net profit for 1959 was £472,050, an increase of £97,901. A final of 50 per cent. is recommended, making 60 (45) per cent. for the year. The chairman, Mr. L. Tweedie-Smith, says that the turnover and profits of the parent and all subsidiaries are considerably higher than those in any previous year since the company's inception in 1919, since when steady and continuous progress has been made.

CONCENTRIC MANUFACTURING COMPANY, LIMITED—The capital is to be increased to £750,000, which will leave 2,400,000 ordinary 2s. shares unissued after providing for the acquisition of Norton Aluminium Products, Limited. The purchase price is £200,000 cash and the allotment of 100,000 of the company's shares to the vendors at 15s. each. Mr. L. J. Cutler, who resigned from the Norton board in February, has been paid £7,000 compensation. An extra-ordinary meeting of the company will be held on June 8.

TRUSCON, LIMITED, engineers and designers of reinforced concrete, of London, S.E.1—Group profit for 1959, before tax, quadrupled from £34,573 to £133,190, and net profit was up from £27,081 to £74,087. It is proposed to raise the dividend on the ordinary shares to 7½d. a share. In the report, the chairman, Sir Halford Reddish, says that all departments contributed to the record turnover. Orders during the first four months of the year are well up on the same period of 1959.

HAWKER SIDDELEY GROUP, LIMITED—Next accounts will cover the 17 months to December 31, 1960, for which period it is expected to pay dividends totalling 15 per cent., against 10 per cent. for the previous year to July 31, 1959. For the current 17 months it is expected to pay two interim dividends, each of 5 per cent., with a final of not less than 5 per cent. Sir Thomas Sopwith, the chairman, states that group results for the current year should not be disappointing.

YARROW & COMPANY, LIMITED, shipbuilders and engineers, of Glasgow—The directors are to recommend that the authorized and issued capital should be increased from £750,000 to £1,000,000 by the creation of 250,000 6½ per cent. cumulative preference shares of £1 and that £250,000 of the general reserve be capitalized and applied in paying up in full such shares, each member to receive one for every three ordinary shares held at the close of business on June 30. The first half-yearly dividend of 3¼ per cent. is to be paid on December 31.

SPIRAX-SARCO ENGINEERING, LIMITED, Cheltenham—The chairman, Mr. L. G. Northcroft, said that the growth and success of the company depended on selling steam traps in very great quantities. Except for the Communist countries and for special reasons the US and Canada, there was no part of the world where the company's products were not sold. Output had therefore been increasing considerably and was continuing to do so this year. He hoped that greater output would enable the company to swallow increased prices from raw material suppliers without raising the selling price.

N. HINGLEY & SONS, LIMITED, makers of wrought-iron bars, ships' cables, etc., of Netherton, Dudley (Worcs)—The directors have made an offer for the 153,000 ordinary £1 shares in M. & W. Grazebrook, Limited, the Dudley heavy general and chemical engineers, etc., on the basis of nine 10s. shares in Hingley's for every five in Grazebrook. Prior to completion of the sale, Grazebrook will make a special distribution of 5s. per share out of the surplus arising from the sale of capital assets. It is the intention of the purchaser to continue the business of M. & W. Grazebrook on the same lines as before.

New Marketing and Finance Heads for Durham Division

NEW marketing director of the Durham Divisional Coal Board is Mr. Alan Shilleto Bean, at present deputy marketing director. Mr. Francis Herbert Newman, divisional chief finance officer, has been appointed finance director of the division. The appointments fill the vacancies caused by the recent death of Brig. C. D. Marley, former marketing director, and the resignation in April of Mr. S. J. Reid, former finance director, whose death is reported in this issue.

Mr. Bean was appointed marketing officer (technical) of the old Northern Divisional Coal Board in 1947. In 1951 he became marketing manager of the Durham Division and was appointed deputy marketing director in 1957. Mr. Newman joined the South-Western Divisional Coal Board in 1948 as chief internal auditor, and in 1950 he was appointed chief accountant of the No. 3 (Rhondda) Area. He moved to Durham Division in December, 1955, as chief accountant and was transferred to his present post in 1957.

IRON AND STEEL TRADE

WAY ahead for the steel industry is bright and alluring. Every branch has benefited fom a rise in consumption—estimated to amount to 1,000,000 tons in the first quarter of the year—and the change from the running down of stocks last year to the new build up has accounted for an extra 500,000 tons in orders placed. Expansion of capacity is planned on an impressive scale and the Iron and Steel Board forecasts some reduction in the current high level of exports—because of rising home demand and keener competition oversea.

Pig-iron

The arrival in the Tees of its biggest-ever cargo of iron ore—a consignment of 17,800 tons of Algerian ore—marks the beginning of the build up of works stocks of imported ores, preparatory to a further rise in pig-iron production. Steelworks' consumption tends to exceed the aggregate output of basic iron, and the rising trend can only be maintained by the operation of more blast furnaces.

The prospects in the foundry iron trade are somewhat obscure. Hitherto, redundancy has been avoided by improving sales for export, but latest reports indicate a rather sluggish recovery in the production of iron castings.

Ferro-alloys

There is no further change in the price of ferro-tungsten, the demand for which continues to be at a slightly lower level. Ferro-molybdenum is fairly active and there is a steady request for ferro-vanadium. Both the high and low carbon grades of ferro-chrome are receiving moderate support, and ferro-silicon maintains its interesting level of activity. Calcium silicide is in fair demand, and there is a steady call on ferro-manganese.

Ferro-titanium is active and there is a good demand for ferro-niobium. Steady attention is given to chromium metal, while silicon metal continues to be of slight interest.

Semi-finished Steel

Working under extreme pressure, billet and slab mills are unable to satisfy fully the requirements of the re-rolling industry.

It is hinted that imports of semi-finished steel will have to be increased, to ensure full employment of the re-rolling mills.

Finished Steel

The swollen requirements of the motor industry have invested with growing urgency the demand for sheets. This branch of the steel industry enjoyed complete immunity from the 1959 recession and the latest figures indicate a spectacular rise in imports since the beginning of the year.

The capital investment programme has also been considerably affected and a quickening flow of orders for all other steel products, not excluding plates, rails, colliery arches, and forgings, is in process of development. At the works every effort is being made to speed up clearances to consumers before the Whitsuntide holidays, after which the summer vacations will impose limitations on the national output figures.

EXTENSION to the pressure-vessel shop of Motherwell Bridge & Engineering Company, Limited, is being built at a cost of £100,000.

Critics of Wear Labour Relations Answered

ACCUSATIONS of bad labour relations in the Wear shipbuilding industry were answered last week by Mr. John Short, chairman of the Sunderland shipbuilding firm of Short Bros., Limited, and immediate past chairman of the Wear Shipbuilders' Association. Speaking at a reception after the launch from his yard of the 11,000-ton motorship Brighton, Mr. Short commented: "Since the end of the war we have never had a dispute which has resulted in our men withdrawing their labour either officially or unofficially except for the general shipbuilding strike of two years ago."

"Surely this record is worth something?" he went on, "and it is the answer to those who refer to recurrent labour troubles on the Wear." Mr. Short thought that the "panic" which seemed to prevail in certain quarters was unwarranted. It was true that there were pockets of unemployment. While that was unfortunate and regrettable, he was confident that they were temporary.

"I am confident," he said, "that the British shipbuilding industry as a whole is as efficient as its oversea competitors and able to hold its own in the open markets now and in the future."

Distington Engineering's New Output Record

RECORD output of 2,074 tons of ingot moulds, bottom plates, slag ladles, and general engineering castings was produced during the week ended May 7 in the ironfoundry of Distington Engineering Company, Limited, of Workington, a branch of the United Steel Companies, Limited.

This follows an earlier British and European record for an ingot mould factory set up by Distington Engineering last February, when more than 2,500 tons of finished castings were produced in one week. These continual high outputs enable the company to keep pace with increasing demands.

MESSAGES OF CONGRATULATION received by the High Authority of the European Coal and Steel Community on the occasion of the 10th anniversary of the Schuman Plan Declaration last week included those from Mr. Richard Wood, Minister of Power, Sir James Bowman, chairman of the National Coal Board, and Sir Cyril Musgrave, chairman of the Iron and Steel Board.

Coalfield News

PLANNING PERMISSION to open a private coal mine at Woodhall, Calderbank (Lanarkshire), has been received by Mr. John Ferguson.

PRESENTATION of binoculars was made to Mr. Cyril Hazlehurst on his departure from Parkhouse Colliery (Derbyshire) after four years as manager there. Mr. Hazlehurst becomes manager of Bolsover Colliery.

DISPUTES at the Yorkshire collieries of Silverwood and Wharncliffe Woodmoor have been settled pending discussions on piecework allowances. About 4,500 tons of coal were lost during the strikes, which involved 1,300 men.

TWO YOUNG MEMBERS of the Hatfield Main Colliery Band who passed auditions for the National Youth Brass Band of Great Britain, were honoured at a presentation concert on Sunday. They were Harry Birkett (bass) who is 17, and Eddie Thompson, a 15-year-old trombonist.

PITHEAD BATHS at the recently-closed Berry Hill Colliery (Staffs) are to be converted into a new mines rescue station for the North Staffordshire Area of the West Midlands Divisional Coal Board. It is hoped that the work will be completed by the end of the year.

PART OF THE No. 2 shaft at Kinglassie Colliery (Fife) collapsed on Saturday at a depth of 600 ft. It happened when a cage became wedged, causing damage to the shaft lining for about 30 ft. No one was injured. Production was suspended in part of the colliery while repairs were carried out.

CLOSURE OF Maude Colliery, Backworth (Northumberland) is being postponed until later this year so that the transfer of many of the miners to the Rising Sun Colliery at Wallsend can be arranged. The pit was originally planned to close "between March and June." Some of the 350 miners there have already been transferred to other pits.

DURHAM MINEWORKERS who remain accident-free from April 4 to July 2, this year, will qualify for one of 561 prizes offered each quarter by the Durham Divisional Coal Board to focus attention on the board's safety campaign. Each of the 51 main prizes will be a weekend coach trip for two to Blackpool. There are 510 consolation prizes of £1 premium bonds.

SUGGESTION THAT housey-housey should be introduced to recoup losses at the £65,000 Coal Industry Social Welfare Organization centre in Glenrothes (Fife) has been opposed by several members of the management committee. As an alternative, the committee decided to cut running costs severely for a three-month trial period. Net loss of nearly £2,000 was incurred over the past two years.

ONE OF THE MOST MODERN collieries in the world, Lea Hall Colliery (Staffs), is to be opened on July 19, by Mrs. E. H. Browne, wife of the chairman of the West Midlands Divisional Coal Board. It is not certain when production will start at Lea Hall, but the nearby Rugeley power station will use small coal from the colliery in the late autumn. Later this year the colliery is to stage "open days" for the general public.

NOTTINGHAMSHIRE miners' annual pilgrimage to Southwell Minster on Sunday included among the congregation of 1,200, 18 miners who had been severely disabled in pit accidents. The event was arranged by the Coal Industry Social Welfare Organisation and the NUM, which was represented by contingents from various groups and branches. The Nottinghamshire Miners' Festival Choir led the singing.

DIPLOMAS were presented at the week-end by Mr. Emanuel Shinwell, Labour MP for Easington (Co. Durham), to 53 members of the Murton Mining Federation who have each been members of Durham Miners' Association for 50 years or more. Other speakers included Mr. J. W. Toft, chairman of the federation, Dr. William Reid, chairman of the Durham Divisional Coal Board, and Mr. J. Stephens, secretary of Murton Miners' Lodge.

INSCRIBED PLAQUE commemorating the golden jubilee of the first mine rescue station in Scotland at Cowdenbeath was presented to Mr. R. B. Dunn, chairman of the central rescue station committee, by Mr. R. W. Parker, the chairman of the Scottish Divisional Coal Board, on Saturday. In presenting the plaque, which is to be incorporated in the building, Mr. Parker said the people of Fife saw the need for that service before legislation was introduced and that the moving spirit behind the Cowdenbeath station had been Mr. Charles Carlow, of the Fife Coal Company, Limited, and other Fife and Alloa coal owners.

AFTER AN APPEAL by Mr. Will Whitehead, president of the South Wales area of the NUM, miners at Garw Pit (Glam) returned to work on Monday so that discussions could take place with the NCB. The men had been on strike for a month and miners at Ffaldau, Ocean Garw, and Glengarw collieries, who came out in sympathy last week, also returned to work on Monday. The strike at Arrael Griffin Colliery (Mon) involving 1,400 men, which started on Thursday of last week over a disagreement between the management and screen workers, also ended on Monday when the men resumed normal working.

SHIPMENTS OF COAL and coke from the South Wales ports last week continued steady, but the total of 45,925 tons was 5,356 tons short of the previous week's improved figure and 7,151 tons below that for the corresponding period last year. Exports from Penarth of 4,963 tons, were the best since the end of January and Barry did better than for some weeks. Tonnages from the various ports in the week ended May 15 (with figures for the week ended May 14, 1959, in parentheses) were:—Newport, 4,213 (11,876); Cardiff, 5,325 (5,443); Penarth, 4,963 (6,068); Barry, 10,568 (13,974); Port Talbot, 1,264 (1,344); Swansea, 19,592 (19,563).

Spoil Heap Control is Sought

MEASURES to control unsightly colliery spoil heaps and restore them to agriculture are being considered by two local authorities. These moves follow the recent "spoil heap" conference at Goldthorpe (Yorks) at which many local authorities in mining areas were represented.

A report on this conference, giving a comprehensive programme for the restoration of spoil heaps, has been presented to the General Purposes Committee of Stoke-on-Trent City Council. The matter will be put before the full council.

Warsop (Notts) Urban Council decided on Monday night to support measures to control spoil heaps. Mr. W. H. Foster said that Warsop was particularly interested as there were two big spoil heaps nearby. While there was no hope of stopping the practice of tipping, the recommendations would go a long way towards meeting the problem.

NEGOTIATIONS have been concluded between the Rover Company, Limited, and Cardiff Council for the purchase of the Old Airport site at Pengam Moor to build a factory there for expanding Rover production.

THE COAL TRADE

RENEWALS of contract are now under way in a good many areas and the re-stocking that is going on, together with a rather better domestic demand than was expected to follow the introduction of summer prices, is giving a fair amount of satisfaction. There is far less inclination to stock coke than coal and coke producers' stocks are beginning to assume something of a problem.

DURHAM AND NORTHUMBERLAND

The forward order-book of the north-east coast iron and steel industry has a healthy look, promising that higher outputs will be maintained over the next few months and with that should come a sustained demand for Durham coking coal and mixing varieties and Durham industrial cokes at higher quantities than applied a year ago. Stocks available and current production is readily meeting this improvement.

Durham and Northumberland superior and graded steams are moving off quite well and while demand for inferior sorts is slackening under some seasonal contraction, power stations are nevertheless taking welcome quantities for this time of the year. Durham gas coal is a moderate trade and household merchants are experiencing a seasonal decline for house coals and ordinary domestic cokes.

The rather better tone in the export section of the market is upheld and while business is not on a large scale, it is showing expansion, with Scandinavia and Western Germany among the important customers.

NORTH WALES

Demand for all grades of coal is surprisingly active for the time of year and many merchants are short of supplies in the lower groups. The anthracite position is easier and many traders are laying in stocks. There is an accumulation of orders for "Phurnacite" at summer prices, but it is expected that the backlog will be cleared by the end of the month.

Adequate tonnages of all grades of coke are to hand but trade is slow. Industrial requirements are adequately catered for.

DERBYSHIRE

The market for all house coals is on a modest scale, and all orders can be handled with expedition. Best and hand-picked coals are being sought for stocking purposes, but demand is not excessive. The better types of screened cobbles and brights are in moderate request, and forwardings are in line with requirements. Cheaper brights are fairly popular and, except for the lowest groupings, are fairly readily obtainable. Best large nuts are not in great favour, and washed medium and small nuts are subject to a modest but steady demand.

The initial demand for "Coalite" is fairly good, and wagons are readily accepted as they arrive, although it seems likely that the position will ease once the first pressure after introduction of summer prices lessens. Other premium smokeless fuels are retaining a certain amount of consumer interest, and supplies are adequate. Most grades of anthracite have eased a little and current orders can be met without much difficulty. "Phurnacite" continues to be plentiful and orders are promptly cleared.

The demand from industrial concerns is fairly constant, and steady forwardings of coals in line with current demand are reported. Nutty slacks continue to be readily obtainable. Dry screened nuts experience a fairly steady call, and there is a fairly even flow of supplies. Hard steam coals are being supplied satisfactorily against a fair demand. Washed fuels are easier now, and delays in collection from local colliery landsales are being considerably reduced. The interest in all grades of hard and gas coke is only limited with, as yet, no great call for building up of stocks ready for next winter.

SOUTH-WEST LANCASHIRE

Very quiet conditions now prevail in the house coal market and little or no interest is being displayed by the general public. Orders are few and for small quantities only. Merchants are making strenuous efforts to induce householders to buy now at the reduced summer prices as unless there is some revival in the demand a very considerable portion of transport will have to be laid up. Supplies of all qualities are readily available but merchants are having to curtail deliveries owing to the short demand. "Coalite" is freely available but the demand has receded. Anthracite nuts which have been such a very difficult market for many months have greatly improved in delivery and some merchants are putting this fuel into stock.

No improvement can be reported in the market for gas coke where the demand has reached a low level particularly for domestic and central heating purposes, large central-heating users, as yet, showing no interest in stocking. Industrial demand for coke remains satisfactory with supplies of all qualities readily available. The same applies in the general industrial market where regular tonnages are coming forward against allocations and industries are taking up supplies regularly by road and rail transport.

Bunker coals remain in steady although much reduced demand and supplies are readily available. Coastwise trade in house coals continues to be very quiet.

Average prices per ton are as follows:—Group 1, 182s. 8d.; Group 2, 163s. 3d.; Group 3, 146s. 5d.; Group 4, 134s. 8d.; Group 5, 121s. 7d.; Group 6, 111s. 5d.; Group 7, 97s.

SOUTH WALES

Swansea.—Demand for domestic coal has fallen. Groups 4 and 5 coals are readily available, but group 3 coal is scarce because of strikes at two of the main collieries. The central heating demand has shown the expected seasonal fall and dry steam cobbles are available for prompt despatch. Anthracite boiler fuel has been in greater demand and delivery is now less prompt.

Prices per ton from May 1.—House coal: Group 3, 155s. 10d.; group 4, 142s. 6d.; group 5, 129s. 2d. Anthracite stove/stovesse: 1a, 241s. 1d.; 1b, 235s. 1d.; 1c, 226s. 7d. Anthracite beans: 1a, 220s. 9d.; 1b, 216s.; 1c, 207s. 4d. Anthracite grains: 1a, 197s. 3d.; 1b, 193s. 6d.; 1c, 185s. 10d.

Appointments

NCB Industrial Relations Officer for Cannock Chase

THE West Midlands Divisional Coal Board has appointed Mr. N. PARKIN industrial relations officer of the Cannock Chase Area. Since 1957 he has been Area wages and control officer. Mr. Parkin began his career as a wages clerk at Doncaster Amalgamated Collieries, Limited. After serving as flight-sergeant during the war, he returned to the industry and held appointments at colliery level in the North-Eastern Division dealing with wages agreements, price-lists, and other industrial relations work.

During this time he was engaged in experimental work on standard costs that necessitated him spending a considerable amount of his time underground dealing with seam measurements, estimation of tasks and seam content in connection with fixing rates for price-lists, etc. Mr. Parkin is an associate member of the Association of Certified and Corporate Accountants.

Mr. LAWRENCE GEE has been appointed sales manager of the Longford Machine Tool Company, Limited, Coventry, in succession to Mr. P. de Havilland.

Mr. D. T. L. RETTIE, marketing director of AEI-Hotpoint, Limited, has been appointed deputy managing director. Mr. C. A. GANDERTON has been appointed manager of the marketing department, and Mr. C. J. A. COOPER, comptroller.

Mr. DONALD A. CAMPBELL has been appointed assistant finance accountant of the East Ayr Area of the Scottish Divisional Coal Board. He was formerly on the administrative staff of the British Aluminium Company, Limited, at Lochaber.

Mr. KEN JONES, for 25 years employed by Laystall Engineering Company, Limited, of London, S.E.1, has joined Sheepbridge Stokes, Limited, of Chesterfield as sales promotion executive with special responsibilities for marketing chrome liners.

Mr. A. T. BAILEY, who has been undermanager of Griff No. 4 Colliery, Warwickshire Area, West Midlands Divisional Coal Board, since 1955, has been transferred to the post of undermanager of North Warwick Colliery. He was previously undermanager at Griff Clara Colliery.

Mr. M. R. B. THOMAS has been succeeded as temporary representative in Norfolk and east Suffolk of the Universal Asbestos Manufacturing Company, Limited, by Mr. J. M. SCARROTT, who becomes permanent representative for the area. Mr. Thomas is to take up an appointment at the company's head office.

North-Eastern Divisional Coal Board has appointed Mr. E. J. ATKINSON manager of Shuttle Eye and Gregory Spring collieries (Yorks). In the No. 7 (Wakefield) Area Mr. R. COLTON has been appointed manager of Gomersal Colliery, Mr. C. A. GRACE manager of Manor Colliery, and Mr. G. WESTON manager of Shaw Cross Colliery.

Mr. J. CONNING has been appointed works manager of the Erith works of British Insulated Callender's Cables, Limited. He joined the company in 1931 as an estimating engineer on power cable systems and was later high voltage cable research engineer until 1949 when he transferred to the Erith works as power cables department manager. He became production manager, power cables division, in 1955.

Mr. J. M. BERRIDGE, East Midlands' representative for the past 11 years of W. H. Allen Sons & Company, Limited, mechanical, hydraulic, and electrical engineers, of Bedford, has been appointed representative for the Liverpool area. Mr. Berridge served his apprenticeship with the company and apart from two years with the British Thomson-Houston Company, Limited, has been with it ever since. He has taken a prominent part in the local government of Bedford and is at present the town's deputy Mayor.

Following the resignation of Mr. M. G. Bolton, Area staff manager/Area secretary, South Staffs. and Shropshire Area, West Midlands Divisional Coal Board, Mr. R. C. COOPER at present assistant Area secretary, has been appointed Area secretary. Mr. C. MORETON, Area staff manager, Cannock Chase Area, will take over responsibility for the staff department in the South Staffs. and Shropshire Area while Mr. T. G. BUTLER, head of the general branch of the staff department in South Staffs. and Shropshire Area, will remain in that post at the Area office, in Oaken, and will be responsible for the day-to-day administration of staff matters in the South Staffs. and Shropshire Area. Mr. Bolton has gone to Canada to take up a post in personnel management.

Slight Drop in ECSC Steel Output

OUTPUT of crude steel (ingots and castings) in the European Coal and Steel Community in April was, at 5,837,000 metric tons, below the record 6,393,000 tons in March but substantially higher than the 5,310,000 tons produced in April, 1959. The April total brought the community steel output total for the first four months of the year to 24,038,000 tons, an increase of 23.4 per cent. on the 19,487,000 tons produced in the corresponding period last year.

April output of pig-iron and ferro-alloys was 4,363,000 tons, compared with 4,685,000 tons in March, and 3,790,000 tons in April last year.

The demand for steel continues strong and orders received for rolled products in the community last month totalled 4,630,000 tons. This was slightly below the near record total of 4,743,000 tons in March, but more than the 4,433,000 tons booked in April, 1959. Last month's figures included an increase of 150,000 tons in orders from non-member countries. Demand from within the community, for many months the main support of the current boom, declined slightly.

The rise in order-books since early 1959 levelled off in February, the latest month for which figures are available. At the end of the month, they were 13,499,000 tons, against 13,494,000 tons at the end of January and 8,871,000 tons at the end of February last year. For the first time in many months, February deliveries were able to keep pace with the many new orders.

Steel Stockholders Growing Importance

HOLDERS of steel stocks have come to be regarded as an integral part of the trade by the manufacturers and they are likely to play an increasingly important part in the steel trade, the North-East Iron & Steel Stockholders' Association was told by its chairman, Major W. Armstrong Brown, on Friday.

Speaking at the association's golden jubilee dinner in Newcastle, Major Armstrong Brown said that 15 per cent. of steel sold goes to stockholders. "If the present trend in America spreads over here, our function will become even more vital," he said.

Law Cases

NCB Sued for £24,869 Over Sewer Subsidence

JUDGMENT was reserved in a Court of Session action in which Midlothian County Council sued the National Coal Board for £24,869 for alleged damage to 370 yds. of the council's main outfall sewer at Smeaton Glen.

The council claimed that damage was caused by the wrongful action of the Coal Board in working a seam under the sewer and withdrawing support from it. A section of the original sewer had to be replaced by steel pipes supported on piers which allowed for periodic adjustment by using jacks to counteract further subsidence.

The board denied liability and contended that the line of the sewer was chosen by the council without notice to the board, which provided full information about plans to work coal in the area. The board maintained that if damage were done as a result of the operations—which was denied—the board was under no obligation to provide support for the sewer, and that if the board were obliged to provide support, this could be done only by curtailing the workings and sterilizing areas of coal under the line of the sewer.

In a counter-claim the board sought to establish that if it was liable to make reparation to the council, the council would be bound to compensate the board for the loss resulting from curtailment of workings. This claim was contested by the council.

OVERTIME PAYMENT CLAIMED

LEADER of a team of men working in the Milton Mains section of Valleyfield Colliery (Fife) is suing the National Coal Board for £16 19s. 6d. at Dunfermline Sheriff Court in a dispute over the setting of girders. The plaintiff, Mr. John Hoy, claims "completion of task" payment of £1 5s.; payment of £2 6s. for the additional work in erecting larger girders; overtime of £1 7s. for discussions, lasting three hours, with the colliery manager; interest of 1s. 6d.; and damages of £12 for "hardship, inconvenience, and loss of time."

For the board it was stated that the action was irrelevant, except for the claims for "completion of task" payment.

When it was pointed out to Mr. Hoy that in a previous hearing he had intimated that he would drop the claim for £12 damages, he agreed to make specific his claim for overtime before the case is resumed next Tuesday.

SHIPYARD DEATH FALL

WIDOW of a shipyard stager who fell 40 ft. to his death at a Hebburn shipyard, was awarded damages of £3,750 at Newcastle Assizes. Mrs. Nora Irene Cairns was given judgment against Hawthorn, Leslie (Shipbuilders), Limited, the employers of her late husband, Mr. John Nicholas Frangulis Cairns (52).

Mr. G. Waller, QC, for Mrs. Cairns, said the accident, which no one saw, could have happened because of a gap between planks. For the company, which denied negligence, Mr. Peter Taylor said it was against all probabilities that an experienced stager would fall through such a gap.

Mr. Justice Streatfeild said he thought Mr. Cairns had fallen through the gap in the staging though it was only 12 in. wide. A man could be thrown off balance for some reason and with his body turning sideways might easily slide through such a gap.

BENCH SEES POWER PRESS

POWER PRESS used in the manufacture of hinges for spectacle cases was demonstrated at Evesham Magistrates' Court, when Willmotts, Limited, Evesham, was fined £25 for failing to fence the machine securely. A girl operator told the court that as she put her foot on the operating pedal, a punch caught the end of her thumb.

Mr. J. L. Bond, general manager, said the type of press had been introduced from America in 1920. Improvements had been made to the guards, but the same method of operating had been going on for 40 years. "To my knowledge there has never been an accident on this type of operation before. We are genuinely concerned about welfare and the prevention of accidents."

TURNER LOSES CLAIM

LATHE turner unsuccessfully claimed £100 damages at Sheffield County Court from his employers, George Turton Platts & Company, Limited, drop-forgers, etc., for finger injuries received at work. In a reserved judgment, Judge Ernest Ould said that the plaintiff, Mr. John Edward Coward, was clearly much to blame for the accident and would hold him four-fifths liable. Therefore the most he could have recovered was £20, but the evidence was against the main claim of negligence.

Giving judgment with costs to the firm, the judge said there had been much confusion over similar cases because of conflicting authorities and it was time the matter was resolved.

COMPANY FINED £100

A COMPANY said to have spent between £10,000 and £12,000 during the last three or four years on guarding machinery and making it safe, was fined £100 by Nuneaton Magistrates for failing to fence a dangerous part of machinery. The company, Sterling Metals, Limited, Nuneaton, pleaded Guilty.

Miss J. M. Davis, HM Inspector of Factories, said the case arose from an accident to an employee whose left arm was caught between the belt and a roller of a conveyor. He suffered friction burns. For the company, Mr. A. Moore said that 50 similar danger points had been remedied, but the roller in question had unfortunately been overlooked.

CONVICTION QUASHED

CONVICTION by the Consett Justices against the Consett Iron Company, Limited, for offences under the Factories Act, 1937, was quashed by the Queen's Bench Division on an application for *certiorari* by the company. The Lord Chief Justice, Lord Parker, said that the company had been charged with three breaches of the Act following an accident in which a man was fatally injured when a lifting tackle chain broke. The company had admitted one charge, but denied the other two.

The justices had at an early stage retired to consider submissions on law on behalf of the company and had rejected them. They then proceeded to hear evidence of fact and at the close the justices rose to retire and the clerk made to follow them. When the company's counsel said he hoped the clerk did not intend to retire with the justices, the clerk replied,

according to the company: "I don't know what you are worrying about; this case is as dead as the dodo." In an affidavit, the clerk denied saying "this case . . ." but "that case . . ." referring to Regina *v.* East Kerrier Justices, *ex parte* Mundy (1952) and the chairman of the justices had said that the clerk had advised only on law.

Lord Parker was satisfied that when the clerk made his remark he was referring to the East Kerrier case, although some people in court may well have understood it to refer to the case before the court. In the circumstances of the case, Lord Parker considered that the order should go. Mr. Justice Byrne and Mr. Justice Ashworth agreed.

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Mr. John Mills said he and Mr. Shenton completed a pack and prepared to withdraw the supports. He went to fetch a chain device, and when he turned round saw that his workmate had been buried by a fall of dirt. Mr. Mills was able to uncover Mr. Shenton's face, but before a rescue could be carried out there was a second fall. He said that neither of them had withdrawn any supports without the correct device or done anything to disturb them.

The deputy, Mr. Miodrag Djuricic, said he inspected the timbering, which was sufficient. There was no chock in the waste because it would not have been wide enough to work with one. Summing up to the jury, the coroner, Mr. F. G. Hails, commented: "Nobody appears to have bothered very much about a chock and the two men, in fact, seemed quite happy to go on working without it."

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The following table gives (in tons) the output of saleable mined coal by division in the week ended May 14, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

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Scottish	367,800	3,700	386,400
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North-Eastern ..	836,900	16,400	829,000
North-Western ..	270,500	200	293,100
East Midlands ..	913,200	—	909,800
West Midlands ..	285,100	4,300	314,400
South-Western ..	391,100	13,000	423,200
South-Eastern ..	30,500	200	30,700
Great Britain—			
Deep-mined coal ..	3,794,900	38,300	3,942,800
Other deep-mined (including licensed mines) ..	43,800	—	57,000
Open-cast coal ..	156,000	—	245,900
TOTAL ..	3,994,700	38,300	4,245,700

Head Wrightson Machine's £700,000 German Order

PROVISION of equipment for a complete billet mill has been ordered by Maschinenfabrik Sack, Gmbh, of Düsseldorf, from the Head Wrightson Machine Company, Limited, a subsidiary of Head Wrightson & Company, Limited. The contract is worth about £700,000 and includes the intermediate roller tables, cooling banks, and mill drives.

The equipment is to be installed at the Redbourn Works of Richard Thomas & Baldwins, Limited, from whom the Düsseldorf company has received a contract for the supply of the complete mill.

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T2GH Auto-Loader

Air-powered Loaders and Dumpers for every underground requirement

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Auto-Loaders

T2G and T2GH auto-loaders allow one man to carry out the complete mucking operation—loading, transporting and dumping. As a result, labour costs are considerably reduced. Fitted with pneumatic tyres, these highly manœuvrable loaders put up excellent performances in both confined spaces and wide areas. Maintenance costs are lower as the rubber tyres help to reduce stress on the loaders. The T2G dumps directly into chutes or ore pockets, whilst the T2GH has a greater dumping height allowing it to discharge directly on to conveyors.

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Loaders in the LM series have bucket capacities ranging from 4 to 21 cubic feet and clean-up ranges from 6′ to 12′ 5″ (1.8 to 3.8 m.) without side-ploughs. The medium-sized model of this series is the LM56. Fitted with pneumatic side-swinging and quick-action controls, this machine is designed to reduce operator fatigue and increase loading capacity. In fact, with a bucket capacity of 7 cubic feet and a clean-up range of 8′ 8″ (2.7m³), it has a loading capacity in excess of any other loader of comparable size!

WRITE FOR LITERATURE—Further information about Atlas Copco loaders and dumpers is given in a series of leaflets and folders—readily available on request. Write for copies to your local Atlas Copco company or agent or to the address below.

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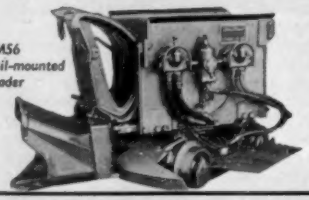
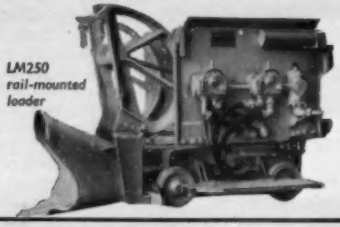
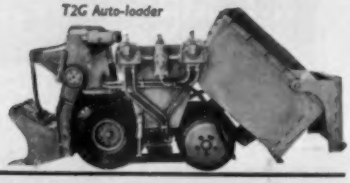


LM56 rail-mounted loader



LM250 rail-mounted loader



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East Midlands ..	913,200	—	909,800
West Midlands ..	285,100	4,300	314,400
South-Western ..	391,100	13,000	423,200
South-Eastern ..	30,500	200	30,700
Great Britain—			
Deep-mined coal ..	3,794,900	38,300	3,942,800
Other deep-mined (including licensed mines) ..	43,800	—	57,000
Open-cast coal ..	156,000	—	245,900
TOTAL ..	3,994,700	38,300	4,245,700

Head Wrightson Machine's £700,000 German Order

PROVISION of equipment for a complete billet mill has been ordered by Maschinenfabrik Sack, Gmbh, of Düsseldorf, from the Head Wrightson Machine Company, Limited, a subsidiary of Head Wrightson & Company, Limited. The contract is worth about £700,000 and includes the intermediate roller tables, cooling banks, and mill drives.

The equipment is to be installed at the Redbourn Works of Richard Thomas & Baldwins, Limited, from whom the Düsseldorf company has received a contract for the supply of the complete mill.

Let ATLAS COPCO take the load

. . . in mining and contracting

T2GH Auto-Loader

Air-powered Loaders and Dumpers for every underground requirement

Headroom, track gauge, car size, clean-up range . . . you take all these into consideration before you buy loaders! That's why you should know about the Atlas Copco range. This includes loaders and dumpers to meet every requirement in underground work and to handle all kinds of muck—abrasive, sticky or free-running—with equal efficiency.

Auto-Loaders

T2G and T2GH auto-loaders allow one man to carry out the complete mucking operation—loading, transporting and dumping. As a result, labour costs are considerably reduced. Fitted with pneumatic tyres, these highly manœuvrable loaders put up excellent performances in both confined spaces and wide areas. Maintenance costs are lower as the rubber tyres help to reduce stress on the loaders. The T2G dumps directly into chutes or ore pockets, whilst the T2GH has a greater dumping height allowing it to discharge directly on to conveyors.

LM Loaders (rail-mounted)

Loaders in the LM series have bucket capacities ranging from 4 to 21 cubic feet and clean-up ranges from 6′ to 12′ 5″ (1.8 to 3.8 m.) without side-ploughs. The medium-sized model of this series is the LM56. Fitted with pneumatic side-swinging and quick-action controls, this machine is designed to reduce operator fatigue and increase loading capacity. In fact, with a bucket capacity of 7 cubic feet and a clean-up range of 8′ 8″ (2.7m³), it has a loading capacity in excess of any other loader of comparable size!

WRITE FOR LITERATURE—Further information about Atlas Copco loaders and dumpers is given in a series of leaflets and folders—readily available on request. Write for copies to your local Atlas Copco company or agent or to the address below.

Sales and service in ninety countries

With companies or agents in ninety countries, Atlas Copco is the world's largest organisation specialising solely in compressed air equipment. Products include stationary and portable compressors rock drills, loaders, hoists, paint-spraying equipment and air tools of every description. Wherever you are, the international Atlas Copco group offers expert advice on the selection of equipment and provides a complete after-sales service.

Atlas Copco

COMPRESSED AIR ENGINEERS

ATLAS COPCO (GREAT BRITAIN) LIMITED

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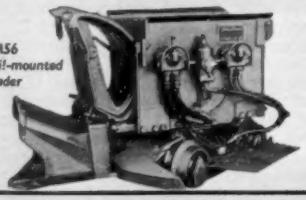
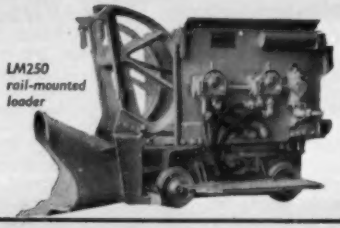
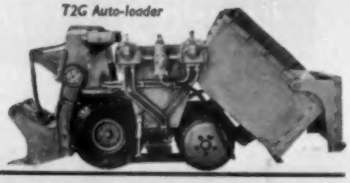
Telephone: Boxmoor 6040



LM56 rail-mounted loader



LM250 rail-mounted loader



T2G Auto-loader

Sales and Service Depots at: LONDON · BRISTOL · CARDIFF · MANCHESTER · NEWCASTLE · WALSALL · LEEDS · GLASGOW · BELFAST · DUBLIN

D170

NEWS IN BRIEF

ALL the national leaders of the Amalgamated Engineering Union have been refused higher salaries by the union's rules revision conference meeting at Blackpool.

REJECTED CLAIM of the NUM for a 12s.-a-week rise for 300,000 day-wage workers is to be submitted to the National Reference Tribunal on July 1. The tribunal, the industry's arbitration court, is already considering claims for shorter hours for miners.

NEW LABORATORIES at Wantage (Berks) of the Isotope Research Division of the Atomic Energy Research Establishment, Harwell, were officially opened on Monday by Lord Hailsham, Minister for Science. They cost more than £750,000.

PRIVATE COMPANY NAMED Campbell-Bruce Electronics has been formed to develop small transistor equipment in the personal communications and industrial fields. First directors are Mr. I. Campbell-Bruce (managing), Mr. M. D. S. Becher, and Mr. R. Howard.

APPLICATION for the allocation of an advance factory being built in Holyhead has been made by the Midland Electric Manufacturing Company, Limited, Birmingham. Subject to the conclusion of negotiations, the company intends to take over the factory at the end of the year.

THE SHAH OF PERSIA recently visited the works of Atlas Copco, AB, at Stockholm. The Shah spent a day as the guest of the company and was shown over the entire works. On leaving, the Shah was presented with two high speed dental drill equipments for use in Persian hospitals.

DUTCH COMPANY has been formed jointly by the British Steel Piling Company, Limited, London, S.W.1, and a Dutch firm of contractors. The new company, Internationale Fundering Mij. (International Foundation Company), will be located at The Hague and will specialize in the construction of building foundations.

NEW LABORATORIES, costing £500,000, at the Harlow (Essex) factory of Associated Electrical Industries, Limited, were opened on Tuesday by Lord Chandos, chairman of AEI. Among activities there will be work on apparatus for increasing the usefulness of electron microscopes and devices for amplifying weak light signals.

FIRST QUARTER SALES and operating revenues of Aluminium, Limited, amounted to $124,632,000, an increase of 31 per cent. from $95,100,000 in the corresponding period of 1959. Consolidated net income for the three months ended March 31 was $8,804,000, or 29 cents a share, compared with $2,310,000, or 8 cents a share, for the 1959 period.

BOTH THIN AND THICK steel chrome plated cylinder liners for a range of commercial vehicle and industrial engines are now being produced by Sheepbridge Stokes, Limited, of Chesterfield, a member of the Sheepbridge Engineering Group. Conversion kits will soon be available, comprising cylinder liners, pistons complete with rings, and gudgeon pins.

QUESTION of the new steel plant being built for Colvilles, Limited, in Scotland making coke for its own use is to be raised with the National Coal Board by the National Union of Mineworkers. Mr. E. Jones, the union's vice-president, said it seemed an "extremely extravagant and unsound policy," because the board was not getting a fair share of the coke-making trade.

AUTOMATIC MACHINE for grading sheet metal has been produced and developed by The Bren Manufacturing Company, of Gateshead, a branch of R. W. Crabtree & Sons, Limited. The machine, known as the Crabtree Grader, is designed to feed and stack sheet metals to and from processing machines. The company is to extend its Gateshead works to cope with current orders.

GERMAN COAL-STEEL concern, Phoenix-Rheinrohr, is increasing to 50 per cent. its holding in Bloehm & Voss, the Hamburg shipyard. Hitherto, the holding was slightly above 40 per cent. It will be increased in agreement with the other shareholder, the Blohn group of Hamburg. At the same time, Bloehm & Voss's nominal capital will be raised from DM 17,000,000 to DM 20,000,000.

THERE WAS an error in a note under the heading "Welsh Coal Industry 'Turning the Corner'" on page 987 of the April 29, 1960, issue of IRON AND COAL in referring to the purchasing and stores controller of the South-Western Divisional Coal Board. This position is held by Mr. L. S. Wilkins. The speaker, Mr. Eric B. Thomas, is departmental secretary of the divisional marketing department.

RESOLUTION protesting against the NCB plan to dump 10,000 tons of pit waste into the sea off Sunderland has been passed by the North-Eastern Sea Fisheries Committee. The dumping is aimed to level the sea bed so that a temporary boring tower can be erected. The committee states that the plan will damage fishing grounds and alleges that the NCB has already dumped waste outside the recognized dumping area.

ALLEGATIONS OF dust and grit nuisance from the Gwaelodygarth works of the Steetley Dolomite (Quarries), Limited, were discussed by Cardiff Rural Council's health committee on Monday. Two representatives of the firm said that the company was very concerned with the problem and was doing its best to find an answer. The committee decided to wait for a report on further progress to be made by the company in six months' time.

DEPUTATION of 39 workers from the Sperry Gyroscope Company, Limited, Bracknell (Berks) visited the House of Commons on Tuesday to protest to MPs about redundancy. About 200 workers at the factory are to be paid off at Whitsun because of the Government decision to abandon the Blue Streak rocket. The management has announced that a second phase of redundancy will have to follow because of the cancellation. It is hoped to switch the remaining 300 workers on the project to other work.

Absenteeism Blamed for Pit's Poor Results

OFFICIALS of the National Coal Board and the National Union of Mineworkers addressed a mass meeting of men from Kilnhurst Colliery (Yorks) on Sunday in an effort to improve output and efficiency at the pit, which has seen several strikes in recent months. The pit employs 2,000 men.

Mr. H. Heap, general manager of the Rotherham Area of the North-Eastern Divisional Coal Board, said that the pit had made a profit only three times since vesting day. He blamed the poor results on absenteeism and strikes. The NUM branch chairman said the branch felt the trouble was due to alleged inefficiency of the management and too little co-operation between the NCB and the union. Mr. Ellis said there was no threat to close the pit, but the possibility hung over their heads if things continued as at present.

Compactness in Underground Air Compressors

A Class RE 'Power Vane' Rotary Electric Compressor specially designed as a Mine-Car unit for underground service in South Africa. Standard units with air or water cooling are available as stationary machines.

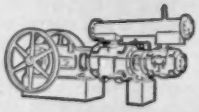
A typical example of how the compactness of the 'Power Vane' Rotary Air Compressor can meet the answer for special underground service is shown in this very low height mine-car unit.

Although the standard 'Power Vane' rotary stationary compressor has different dimensions it is the most compact machine of its class in mining operation today.

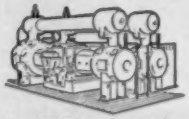
'Power Vane' rotary units are water cooled for surface operation or air cooled with flameproof drive and complete protection equipment for underground service.

Comprehensive literature is available on request.

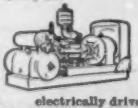
THERE IS A CP COMPRESSOR FOR EVERY TYPE OF DUTY



Class T straight line, double-acting, single and multi-stage compressors for outputs up to 745 c.f.m. or pressures up to 2,500 p.s.i.



Class FE balanced-opposed multi-cylinder compressors for outputs up to 8,000 c.f.m. or pressures up to 5,000 p.s.i.



Class RE electrically driven Rotary Air Compressors for outputs up to 510 c.f.m. at 100 p.s.i.

Class P two-stage air cooled compressors for outputs up to 477 c.f.m. at 100 p.s.i.

Consolidated Pneumatic

CONSOLIDATED PNEUMATIC TOOL CO. LTD · DAWES ROAD · LONDON · S.W.6

CP/206

"Stop the Sneer Campaign Against Coal"

HOPES of a more public-spirited attitude towards the coal industry were expressed by Sir William Lawther, former president of the National Union of Mineworkers, addressing an audience of miners and their families at the Northern (N&C) Divisional Coal Board's first-aid competition finals at Newcastle-upon-Tyne last week. "A less critical and sneering attitude would be more helpful to the industry," he said. "I believe there is a future for coal, but you have to fight for it."

Sir William continued: "When I see Labour-controlled local authorities substituting oil for coal in some of their schools and hospitals, I wonder whether they are mad or whether I was mad for helping to put them there." Without the efforts of the miners, he said, there would be no Britain or any of the privileges now enjoyed.

"There are people far outside the industry who know more about it than the people inside. If only they were there instead of you it would be wonderful how well they would be able to run it—in fact they would run it out altogether," he added.

Competition results.—Seniors: 1 West Wylam (483 pts.); 2 Cowpen Mill (443); best individual, G. Hamilton (West Wylam). Juniors: 1 Ashington "Carl" (419); 2 Cambois (408); best individual, T. W. Moore (Ashington "Carl"). Juveniles: 1 Harrington No. 10 (463½); 2 Bedlington "D" (461); best individual, D. Taylor (Harrington No. 10).

Coal Chartering

THE coal markets are quiet and there has been no real development from Hampton Roads, with charterers nominally quoting. While there is no real inquiry from the Roads to the usual continental discharge, there are possibilities of relet cargoes being available at about the last figure paid. Actual charterings to Japan have been on a reduced scale with Roads/Moji-Kawasaki range reporting 11,500 tons for middle June/July 11 at $8.65, and prompt 13,000 tons to Japan was fixed at $9.35. Further June 13,000 tons (relet) was fixed at $8.75 to Hirohata-Muroran. Inquiry is maintained and it may still be possible to arrange consecutive voyages.

Emden/Sicily reports 23s. for 4,700 tons June 1/10, and Gdynia or Gdansk/West Italy paid 23s. 6d. for 9,800 tons June, and 5,500 tons for May from Gdansk only, secured 24s. 6d. Further tonnage has been taken up from Gdynia or Gdansk to South America, two vessels of 9,800 tons for late June/July 30 being fixed to Buenos Aires or La Plata at 37s.

Scottish Miners' Russian Guest Seeks Asylum

ONE of a group of Russian singers and dancers invited to Scotland by the Scottish National Union of Mineworkers has asked for political asylum in Britain, it was learned yesterday. The party, which was due to return home last night, took part in the miners' May Day rally in Edinburgh.

The Scottish Home Department in Edinburgh is dealing with the matter.

Machine Tool Plans for Research Body

WHAT is described as a "caretaker" committee has been set up by the Machine Tool Trades Association to take charge of the co-ordination, with the Department of Scientific and Industrial Research, of plans for the creation of a machine-tool research association. The committee is headed by Mr. J. C. Snow, vice-president of MTTA.

Mr. E. W. Field, president of MTTA, said in his address at the recent annual meeting that the interlinked subjects of education and research must receive far greater attention in the immediate future than they had in the past. In addition to working for the creation of a research association, the MTTA was soon to appoint an education officer, whose duties would include the making of a survey "on both a qualitative and quantitive basis" of the design teams at present working in the industry.

Mr. Field reported that there had been a substantial revival in the industry's order-book and he added that although the main revival had come from development plans in one of the largest users (the car industry), the spread of orders covered nearly the whole field of machine-tool manufacturing. In some sectors the recovery had reached the stage where present manufacturing capacity was insufficient to meet demands. He added that machine-tool users should take advantage of recession periods to re-equip their production lines.

Tyne Staith May Close as Coal Shipments Fall

BECAUSE of the decline in Tyne coal shipments, the Tyne Improvement Commission is considering closing either No. 5 staith at Whitehill Point, North Shields, or its Howdon staith. It was reported at Tuesday's meeting of the commission in Newcastle that negotiations were in progress with the National Coal Board and other interested parties.

The commission has also recommended that from the end of this month, single-shift working should be introduced at the Whitehill Point staith to replace the present double shift system. This is because of the difficulty of recruiting and retaining a full complement of teemers through the fall in shipments and consequent reduction in earnings.

The slump in coal trade in recent years has caused the commission to close one of its staiths at Tyne Dock, and two months ago the NCB closed one of its loading staiths. Except for the war years, Tyne coal shipments last year were the poorest of the century. This year there has been a further decline.

The Docks and Trade Committee of the commission report that coal and coke shipments from the port in April totalled 456,534 tons, a reduction of 6,010 tons on April last year. Total shipments for the first four months of the year were 2,028,965 tons, a decrease of 33,483 tons on the equivalent figures last year. Export cargoes rose by 33,603 tons to 241,823 tons, but coastwise shipments dropped by 61,319 tons to 1,771,693 tons. There was also a drop of 5,767 tons in bunker ments, to 15,449 tons.

Electrical Aids in Industry *Data Sheet* **No. 13**

Infra-Red Heating

Infra-red heating is the name given to the method of using in industrial processes radiant heat from heaters specifically designed for that purpose. This differentiates it from methods employing both radiation and convection, as in furnaces, although the effect of the radiation is much the same in both cases.

Radiant heat provides a higher rate of heat transfer to bodies not highly reflective than does convection, unless high-velocity forced convection is used. The rate of heating of a body depends on the intensity of radiation on its surface, the proportion absorbed by the surface and, after that, on heat conduction. In heating very thin bodies, for example paint films, the radiation not reflected nor absorbed passes through and is in turn reflected or absorbed by the underlying material. This reflected heat is partly absorbed by the paint film "on the way back". Despite this effect infra-red gives mainly a surface heating effect except in the case of a few special applications.

Infra-red heaters mainly use metal-sheathed elements in special reflectors, but infra-red lamps with internal reflectors are still used in special cases. Other types use silica-sheathed elements or quartz-sheathed lamps in reflectors. A wide range of heaters is available with simple mounting arrangements to enable heat to be applied quickly and effectively either in a production line or in some odd corner.

Control of the charge temperature is effected by regulating the heating time and power. In the case of a moving charge, this is done by adjusting the conveyor speed and the number of heaters in circuit, i.e. by adjusting the effective length of the oven. Some of the heaters may be controlled by energy regulators or adjustable transformers.

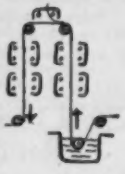
The advantages of infra-red heating over convection heating include reduced heating times, reduced floor space, lower installation costs, almost instant starting, ability to focus the heat, and flexibility in effective oven length. Infra-red ovens can often be mounted in the roof, saving valuable floor space. Infra-red heating is not generally favourable for heating large bodies of low heat conductivity.

Paint Stoving

Many paints, particularly synthetic enamels, and including synthetic wood finishes, are well suited to infra-red heating, and many products ranging from small components to complete motor cars are being successfully stoved. Infra-red heating reduces stoving times very considerably and often improves the finish.

Moisture Extraction

Infra-red can provide high drying rates, either of liquid surface films or of thin absorbent materials. Sheathed element heaters usually give the highest rates, but lamps are sometimes used where the dried material is particularly heat-sensitive. Applications include such tasks as drying of paper and textile products, bottle seals and labels, clayware glazes and many others.



Plastics

Infra-red is widely used in the plastics and allied industries for such typical applications as softening and curing of plastic sheets and belts, heat setting of nylon and similar fabrics, drying and curing of plastic and rubber coatings and others where a plastic forms the whole or part of a product.

The above are just a few examples of successful applications of infra-red. In many other processes infra-red heaters can often be fitted quickly and cheaply, to save time, labour and floor space and, therefore, money.

For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London W.C.2. Telephone: TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each, or 9/– post free) are available—"Resistance Heating" is an example; "Induction and Dielectric Heating" is another.

E.D.A. also have available on free loan in the United Kingdom a series of films on the industrial uses of electricity. Ask for a catalogue.

8131-4

25 Vessel Orders for Vickers Yards

FIRM order-book for 25 vessels is reported by Vickers-Armstrongs (Shipbuilders), Limited, a member of the Vickers group. The review circulated with the 1959 accounts states that 1960 would be a year of full load for Barrow and Naval Yards.

The falling-off in freights had greatly affected the shiprepair industry and the Palmers Hebburn works dealt with only 52 vessels, totalling 540,000 tons in 1959. However, the Barrow works of Vickers-Armstrongs (Engineers) was fully employed and there was promise of plenty of work for the marine department this year. Considerable departmental capacity for the greater part of the year was engaged on two large contracts from British steel companies for rolling mill equipment, and delivery on the first contract was well advanced, the review states.

Operating companies of the English Steel Corporation (whose ordinary capital is held by Vickers and Cammell Laird & Company, Limited), continued to work below capacity for the first half of 1959. Later, however, full production was resumed in those sections on lighter products. Steel production totalled 464,197 tons, a drop of 41,463 tons.

Group sales totalled £155,540,000 against £176,850,000 in 1958. The net profit was £4,934,000 (£6,592,000) and the dividend is repeated at 10 per cent.

Steel Firm's £750,000 Removal Bill

SCHEME costing £750,000 to move Rotherham Forge & Rolling Mills Company, Limited, to a new site, will start this year. The move is being made from the present central site on the banks of the River Don to make way for the new Rotherham by-pass.

The whole plant is being moved about 200 yds. to Greasborough Street, where Rotherham Corporation has in recent years cleared a number of slum houses. Considerable plant expansions will be made on this new and larger site.

The work may take up to 10 years to complete, but will have to be speeded up if the Ministry of Transport orders an earlier start on the by-pass.

Apprentices Go Back to Work

UNOFFICIAL strike of apprentices, which has been in progress for a month, ended on Tuesday. At a mass-meeting of strikers' representatives from all over the country in Liverpool on Saturday a return to work was recommended so that talks could be held with the engineering and shipbuilding employers on the pay claim.

The Confederation of Shipbuilding and Engineering Unions will present the claim to both groups of employers today (Friday). Both the shipbuilding and engineering employers have given assurances that there will be no victimization when the boys return to work.

At its peak the strike involved some 60,000 apprentices.

VENESTA, LIMITED—Mr. G. A. Gardner has been appointed an executive director.

Ore Chartering

DESPITE a fair miscellaneous inquiry from the Mediterranean area actual fixtures, particularly from the North African coast, have been on a small scale. This to some extent is due to some shortage of the larger sizes and will possibly shortly reflect on the handier size of vessels in view of prospects from the Baltic area.

Bauxite has been fixed from Itea to Caronte for May/June loading at 25s. 3d. on gross terms for about 5,300 tons and there are inquiries from southern France to the Bristol Channel for prompt loading. No iron ore fixtures are reported from the North African coast to the Continent but a cargo of burnt ore has been fixed from Malaga-Barcelona range to Lubeck for 4,000-4,300 tons late May at 28s. f.i.o. with interest from this area/Continent maintained.

West African chartering is slow to develop but there is a fair inquiry and Konakri/Poland reports 9,500 tons for early loading at 29s. f.i.o. and trimmed. Further cargoes of burnt ore have been arranged from Bilbao to Rotterdam for May shipment at 21s. on gross or 17s. 9d. on f.i.o. terms but the prompt stemming position at the moment is difficult.

No phosphate fixtures have been reported from Casablanca to the UK but further tonnage has been taken up for China, 11,000 tons for May at 60s. 9d. and 9,500 tons for May/June 15 at 6d. less, in both cases with the option of Safi loading at 1s. extra. Casablanca/Holland at 21s. 6d. is somewhat firmer for 9,500 tons late May/middle June. Pyrites reports Vassiliko Bay/Rotterdam 9,500 tons middle June at 27s. and 10,000 tons June/July from Morphou Bay/Rotterdam at 6d. less.

Coal Board Loss of £20,000,000 Last Year

LOSS of about £20,000,000 was made by the National Coal Board last year, bringing the cumulative deficit since nationalization to more than £50,000,000. These figures will be officially released at the end of the month, when the board publishes its annual report.

The deficit was entirely incurred in the second half of last year, since in the first half-year the board made a profit of just over £1,000,000. But the surplus was turned into deficit in the third and fourth quarters by the holiday period and the rise in unsold stocks, which cost the board £1 a ton a year, plus annual interest increases of 6s. a ton.

Most of the £20,000,000 deficit was incurred by the cost of stockpiling coal last year. A subsidiary cause was the run-down in open-cast operations, the most profitable field of the board's activities.

CRESWELL DEPENDANT THANKS DISASTER FUND COMMITTEE

LETTER from a grateful dependant expressing appreciation of the work of the Creswell Colliery Disaster Relief Fund management committee was read at a meeting of the committee and trustees in Chesterfield on Thursday of last week. The secretary, Mr. A. C. Godber, reported that the fund had paid out £120,650 since its inception.

Mr. Godber said that £4,157 had been paid to dependants in the first four months of 1960.

REFRACTORY CONCRETE

The ADAPTABLE Refractory Material—SAVES TIME AND MONEY

A MUST for FURNACE & BOILER FOUNDATIONS
HEAT-RESISTANT FLOORS
FURNACE DOORS & DAMPERS
FLUES & FLUE-PIPE LININGS
KILN CAR & BOGIE TOPS
COKE OVEN DOOR LININGS
BURNER BLOCKS

AND 101 OTHER REFRACTORY USES

Refractory Concrete (stable under load up to 1350°C) is made with crushed firebrick and Ciment Fondu Ready for any purpose in 24 hours

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ALUMINOUS CEMENT

USE SECAR 250
(An iron-free white calcium-aluminate cement)
for
Super Duty and Special Conditions of:
Higher temperatures up to 1800°C
Reducing atmospheres
Resistance to slag attack
Resistance to products of combustion

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LAFARGE ALUMINOUS CEMENT COMPANY LIMITED, 73 BROOK STREET, LONDON, W.1. Tel: MAYfair 8546

AP 81

Increases of Capital

DAVID G. LEWIS (BIRMINGHAM), LIMITED, engineers, etc., of Birmingham, increased by £35,000, in £1 ordinary shares, beyond the registered capital of £10,000.

BLACK-CLAWSON INTERNATIONAL, LIMITED, engineers, etc., of London, W.1, increased by £350,000, in 2s. 6d. ordinary shares, beyond the registered capital of £650,000.

CAIRD & RAYNER, LIMITED, engineers, coppersmiths, etc., of London, E.14, increased by £75,000 in 5s. ordinary shares, beyond the registered capital of £150,000.

SPEAR & JACKSON, LIMITED, manufacturers of saws, edge tools, etc., of Sheffield, increased by £295,000, in 5s. ordinary shares, beyond the registered capital of £280,000.

WELLINGTON TUBE HOLDINGS, LIMITED, Great Bridge, Tipton (Staffs), increased by £750,000, in £1 unclassified shares, beyond the registered capital of £1,500,000.

WELLMAN SMITH OWEN ENGINEERING CORPORATION, LIMITED, London, S.W.1, increased by £800,000, in £1 ordinary shares, beyond the registered capital of £1,600,000.

SIPLEX, LIMITED, mechanical engineers, smiths, etc., of Frimley, near Aldershot, increased by £49,900, in £1 ordinary shares, beyond the registered capital of £100.

R. & M. SUTCLIFFE, LIMITED, engineers' merchants, etc., of Triangle, near Halifax, increased by £9,400, in £1 ordinary shares, beyond the registered capital of £1,000.

ASSOCIATED BRITISH MACHINE TOOL MAKERS (HOLDINGS), LIMITED, London, S.W.1, increased by £400,000, in £1 ordinary shares, beyond the registered capital of £100,000.

BECK & MOSS, LIMITED, electric metallurgists, etc., of Hanley, Stoke-on-Trent, increased by £7,500, in £1 ordinary shares, beyond the registered capital of £2,500.

SAMUEL PLATT, LIMITED, ironfounders, engineers, etc., of Wednesbury (Staffs), increased by £336,100, in £1 ordinary shares, beyond the registered capital of £75,000.

GERMETRIC FORM TOOLS, LIMITED, Balsall Heath, Birmingham, increased by £25,000, in 20,000 ordinary and 5,000 preference £1 shares, beyond the registered capital of £10,000.

G. H. BOWEN, LIMITED, chemical and general engineers, etc., of Burton-on-Trent, increased by £40,000, in £1 ordinary shares, beyond the registered capital of £10,000.

AURORA GEAR & ENGINEERING COMPANY, LIMITED, Sheffield, increased by £250,000, in £1 cumulative redeemable preference shares, beyond the registered capital of £250,000.

BRITISH MANUFACTURERS & RESEARCH COMPANY, LIMITED, engineers, etc., of Grantham (Lincs), increased by £400,000, in £1 shares, beyond the registered capital of £100,000.

JOHN SMITH (KEIGHLEY), LIMITED, engineers, machine and tool makers, etc., of Keighley (Yorks), increased by £100,000 in £1 shares, beyond the registered capital of £100,000.

LEESONA HOLT, LIMITED, manufacturing and general engineers, etc., of Rochdale (Lancs), increased by £349,000, in £1 ordinary shares, beyond the registered capital of £1,000.

GEORGE H. SCHOLES & COMPANY, LIMITED, mechanical and electrical engineers, Manchester, increased by £300,000, in 5s. ordinary shares, beyond the registered capital of £300,000.

DELTA METAL COMPANY, LIMITED, London, S.E.10, increased by £1,000,000, in £1 6 per cent. non-redeemable cumulative preference shares, beyond the registered capital of £8,000,000.

F.H. (NEWCASTLE), LIMITED, mechanical and electrical engineers, etc., of Newcastle-upon-Tyne, increased by £47,500, in 1s. ordinary shares, beyond the registered capital of £2,500.

N. G. BAILEY & COMPANY, LIMITED, electrical engineers and contractors, etc., of Ilkley (Yorks), increased by £90,000, in £1 ordinary shares, beyond the registered capital of £10,000.

RUSHWORTH & COMPANY (SOWERBY BRIDGE), LIMITED, mechanical engineers, etc., of Sowerby Bridge, increased by £29,000 in £1 ordinary shares, beyond the registered capital of £1,000.

JOHN FOLKES GROUP, LIMITED, manufacturers of steel forgings, etc., of Stourbridge (Worcs), increased by £400,000, in 1s. ordinary shares, beyond the registered capital of £600,000.

MICRO SCREW & BOLT COMPANY, LIMITED, manufacturers of and dealers in screws, etc., of Leeds, increased by £3,000 in £1 ordinary shares, beyond the registered capital of £3,000.

THOMAS SMITH & SONS (RODLEY), LIMITED, mechanical and electrical engineers, of Rodley, Leeds, increased by £500,000 in £1 ordinary shares, beyond the registered capital of £250,000.

MUNICIPAL APPLIANCES COMPANY, LIMITED, manufacturers of engines, boilers, machinery, etc., of Preston, increased by £10,000 in £1 ordinary shares, beyond the registered capital of £50,000.

W. F. & L. W. OFFORD, LIMITED, mechanical and general engineers, etc., of Portslade-by-Sea (Sussex), increased by £30,000 in £1 ordinary shares, beyond the registered capital of £10,000.

SUTCLIFFE & WAITE, LIMITED, sheet metal workers, etc., of Radcliffe, Manchester, increased by £18,000, in 3,000 ordinary and 15,000 preference shares of £1 each, beyond the registered capital of £2,000.

EASTWELL & LODDINGTON IRONSTONE COMPANY, LIMITED, Staveley Works, near Chesterfield, increased by £50,000 in 25,000 "A" and 25,000 "B" shares of £1, beyond the registered capital of £50,000.

D. H. & L. PICKARD, LIMITED, dealers in stainless non-corrodible and non-ferrous metals, etc., of London, E.14, increased by £98,000, in £1 ordinary shares, beyond the registered capital of £2,000.

JOHN BRUCE (ENGINEERS), LIMITED, Eynsham (Oxon), increased by £40,000, in 30,000 "A" ordinary and 10,000 6 per cent. cumulative preference shares of £1 each, beyond the registered capital of £35,000.

HORSELEY BRIDGE & THOMAS PIGGOTT, LIMITED, ironfounders, engineers, etc., of Tipton (Staffs), increased by £440,000, in £1 6 per cent. cumulative preference shares, beyond the registered capital of £1,560,000.

J. A. PERKINS & COMPANY (NORTHAMPTON), LIMITED, general engineers, etc., of Northampton, increased by £49,000, in 9,000 ordinary and 40,000 "A" ordinary shares of £1 each, beyond the registered capital of £1,000.

F. & M. SUPPLIES, LIMITED, manufacturers of oils, pastes and powders for foundries and metallurgical industries, etc., of London, E.14, increased by £10,000, in £1 ordinary shares, beyond the registered capital of £10,000.

NORTON-HARTY ENGINEERING COMPANY, LIMITED, Great Bridge, Tipton (Staffs), increased by £149,900, in 32,000 6 per cent. redeemable cumulative preference and 117,900 ordinary £1 shares, beyond the registered capital of £100.

EMPYRIUM WELDING & MANUFACTURING COMPANY, LIMITED, Birmingham, increased by £100,000, in 50,000 7½ per cent. cumulative redeemable preference and 50,000 ordinary shares of £1, beyond the registered capital of £100,000.

SUPERVENTS, LIMITED, sheet metal workers, ventilating engineers, etc., of Sidcup By-Pass (Kent), increased by £25,000, in 23,750 ordinary shares of £1 and 25,000 founders' shares of 1s. each, beyond the registered capital of £10,000.

Nothing Like a Solid Days' Work, Apprentices Told

IN an age of rationalization and automation there is no substitute for skill, experience, and a solid day's work, said Mr. J. G. Boddy, director and general manager of the motor and control division of Associated Electrical Industries, Limited, recently. Addressing apprentices and their parents at the Newcastle (Staffs) works of AEI, Mr. Boddy said there was a tendency in recent years for apprentices to believe that the only passport to success in their industry was high academic distinction.

Mr. Boddy did not want to belittle that aspect of the work but he would not place it higher than the best craftsmanship, leadership, or similar attributes. He went on to say that he was still old-fashioned enough to believe that an engineer who was a good cover point or a good centre-half would be better than the one who was not.

Awards and indentures to apprentices were presented by Mrs. Boddy. Winner of the silver medal for the best craft apprentice of 1959 was Harold Tabbenor (maintenance department) and the silver medal for the best technical apprentice was awarded to Derek Heath. John White (drawing office) won the supervisor's silver medal.

Russia Buys British

MANY kinds of British equipment, including complete plants for the consumer goods industries are being sought by the Soviet Union, according to Mr. M. V. Gubanov, head of the Technopromimport trade organization. Among orders recently placed in England, Mr. Gubanov mentioned equipment for reinforced concrete from Mather & Platt, Limited, and a "considerable quantity" of textile machinery from Platt Bros. (Sales), Limited, Oldham.

Negotiations are also in hand with British Northrop Loom Company, Limited, Blackburn, and Platt Bros. (Sales), for further large purchases of textile machinery, and with the A.P.V. Company, Limited, Crawley (Sussex), for the possible purchase of machinery to process different kinds of fruit juices.